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[Special Telegraphic Correspondence from Columbus, Ohio.]

"THREE STARS" ON THE OHIO MEETING.

COLUMBUS, O., March 16, 1892.

Dear JOURNAL: The first day's session of the Eighth Annual Meeting of the Ohio Gas Light Association was brought off in complete and satisfactory fashion, and I send you over the wire some account of what was done. If winter ever lingered in the lap of spring, this is the winter that has so dallied to the full. In fact, I fear that much more of this dalliance will cause a rather general recourse to the memory of the oldest inhabitant for a parallel. The West is still in the embrace of the frost king, but amidst all the snow and ice the Ohio Association's banner is fairly blazoned with a bright "Excelsior." President Wilkiemeyer had the beaming satisfaction of reading a most excellent inaugural message to an assemblage of not less than 50, which was augmented almost 50 per cent. before the termination of the day's session—pretty good for the infant, eh! The weather conditions were clear and cold, and the attendance included Mr. Chas. R. Faben, Jr., who it pleases me to say has entirely recovered from his recent severe illness, flanked by his *fidus achates*, the only Fred. Persons, and Dr. McFadden, of Philadelphia. Prominent, too, were Mr. Warmington, of Cleveland, whose tussle with the Rose-Meyer combination's proposed 60-cent gas ordinance seems not to have caused even a flutter in his usual placidness, and Mr. Dickey, of Baltimore, prim as a Doctor of Divinity, with a good foil in the person of bold Ben. Chollar, of St. Louis—and then that Nestor of them all, Mr. Starr. The East has not so far mustered in much strength, although S. F. Hayward, of your city, may be named with Dr. McFadden. The meeting room, which is the hall devoted to the uses of the employees of the Columbus Gas Light and Coke Company, is a most comfortable one, and thus your prediction of March 7 is verified. Secretary Butterworth comes in for much praise for the nicety with which the preliminaries were carried out, but these are always expected of him—an expectation that is usually realized. Of course, it was a sure thing that President Wilkiemeyer would have much to say about the situation of the industry in respect to the manufacturer's part therein, and the legal and financial aspects as well. Mr. Wilkiemeyer did not disappoint his auditors, and the result is a paper that is as full of meat as an egg is of nourishment. I cannot do justice to it in these despatches, but I will say that it is an admirable document. The apparatus exhibit is more than ordinarily interesting and instructive, and a similar verdict applies to the concentrator display made by Messrs. Stroh & Osius. The papers read show careful preparation and were well received. This is best proved by the discussions that ensued, which were sharp, entertaining and concise. The Association endorsed fully the steps taken by the Permanent Gas Industry Council, and the feeling in respect to ultimate success in the showing to be made at the World's Fair Exhibition is pronounced. So far 25 names have been added to the membership rolls, which may be accepted as evidence that the Ohio proposes to keep in the field. I will send you something more to-morrow.—*_*

COLUMBUS, O., March 17, 1892.

Spring's lap must be very damp to-night, for it snowed all day, much to the disgust of the Columbus division of the Son's of Erin. Indeed, it looks and feels very much like winter. The storm, however, did not interfere with the meeting, which was attended in larger force even than on yesterday. Among the visitors was the spry Manager of the American Gas Company's properties, Mr. George G. Ramsdell; and I should have told in yesterday's budget that Mr. A. C. Humphreys, of the Permanent Gas Industry Council, took a most vigorous stand in the matter of the dilly-dallying or worse that is being indulged in by the World's Fair Commissioners with respect to recognition of the gas industry. The resolution passed by the Ohio Association in the World's Fair instance is as follows: "*Resolved*, That the Ohio Gas Light Association heartily approves of the work so far done by the Gas Industry Council looking to the organization of a special gas exhibition at the Columbian World's Fair." Instead of a banquet, the "diversion" consisted of a visit to the Opera House, where some very bad music and more than wretched acting prepared the audience for nightmare as thoroughly as

though a banquet had been the "set number." The officers chosen were: President, C. H. Welch, of Athens; Vice-President, G. H. Tayler, of Warren; Secretary, I. Butterworth, Columbus. The next meeting will be held at Columbus. The paper list was completed satisfactorily, and the question-box was filled to the cover. In fact, if anything, there was really too much on the programme for the time at command. In conclusion, I may say that the meeting was entirely successful.—*,*

BRIEFLY TOLD.

Death of Mr. Thomas Wilbraham.—Last Monday we printed a brief notice of the death of Mr. Thomas Wilbraham, senior member of the firm of Wilbraham & Brothers, iron founders of Philadelphia, a firm well known to the fraternity as the manufacturers of the Wilbraham gas exhaustor. We are indebted for the following synopsis of the history of deceased to a Philadelphia correspondent: "Thomas Wilbraham was born in England, leaving that country in company with his parents in 1842. During the passage over, the vessel was wrecked on the Fire Island (N. Y.) shoals, and, although saved from drowning, everything they owned was lost. They settled in Philadelphia, where young Wilbraham was bound out as an apprentice in Brooks' machine shops at Frankford, where he learned the trade of a machinist, subsequently going to the shops of the Reading Railroad, where he remained but a short time. He was one of the machinists selected to accompany the late Mordecai Reed on his trip to Cuba. On his return he determined to visit California during the feverish times of 1849, and remained there for several years. He was afterwards employed by Commodore Cornelius Vanderbilt, and ran the first steamboat on the Nicaragua Lake. Having saved a little money, he returned to Philadelphia and engaged in the iron business at the present site of the Wilbraham foundry, Frankford road and Amber street, under the firm name of Wilbraham & Whittington; the latter, however, soon withdrew, and his two brothers, James and John, were admitted to the firm. His wife, two sons and two daughters survive him. He was a member of the American Society of Civil Engineers and of the Society of the Sons of St. George." To this we may add that deceased was a man noted for his probity, and that he was thoroughly grounded in the principles and practice of his chosen profession.

Notes.—Attention is called to the advertisement of Mr. W. N. Grubb, Secretary of the City Gas Light Company, of Norfolk, Va., who asks for tenders for the construction of a telescopic gasholder (to be placed in metal tank) rated to retain 300,000 cubic feet.——Attention is also called to the requests of the authorities of the Staunton (Va.), Nashville (Tenn.) and Montreal (Can.) Gas Companies for tenders for the coal tar produced on the respective works.——We are in receipt of the Seventh Annual Report of the Massachusetts Board of Gas and Electric Commissioners, which is an admirably compiled document, as usual. We will refer to it at length in subsequent issues.——The Cleveland marketmen assert that if the city does not order the substitution of gas for kerosene in the market buildings that they will refuse to pay rent for their stalls.——The Chattanooga (Tenn.) Gas Light Company will build a handsome office building, on a plot located on Cherry street, just back of the Mc Connell Block. The dimensions are 50 feet front, 110 feet deep and 32 feet in height.

The Market for Gas Securities.

The market for Consolidated during the week was not noteworthy, the stock hovering between 112 and 113. Equitable was strong at 141 and 143, and Mutual jumped to 131–32. Standard showed no particular change, but it ought to be stronger, if only on the authoritative announcement that the Company is no longer in the market for General Managers. The annual meeting of the Standard (2d Wednesday in May) promises to be a right interesting one. Over in Brooklyn the tangle is greater than ever, and the proposed consolidation seems to grow less definite—too many would-be "General Managers" are in the field. Meanwhile shares are all strong and higher, with Nassau in the lead at 142 bid. A sale at auction is reported of a small lot of Flatbush gas, at 98. These shares ought to be worth 125. Chicago is weaker, at 74¾, and Baltimore Consolidated is in demand at 51¼–½. Bay State, of Boston, is weaker; a remark that applies just now to most of the Addicks specialties. Going back to Brooklyn affairs, it is pretty well settled that the Equity works will be completed within four months, and when the inside history of the delay comes out, the honors will easily rest with Messrs. Hetfield and Fanshawe for the victory won by them, a victory unsmirched by doubtful means of gaining it.

[Official Report—Revised by the Secretary—Concluded from Page 370.]

TWENTY-SECOND ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held at Young's Hotel, Boston, Mass., Feb. 17 and 18, 1892.

Second Day—Morning Session.

The President—We have two papers relating to the purification of gas by the use of oxide, one of which is by Mr. William A. Wood, of the Boston Gas Light Company, and the other is by Mr. Z. M. Jenks, of the Woonsocket Gas Light Company. We propose to have both these papers read before any discussion, as they are so nearly alike.

Mr. W. A. Wood thereupon read the following paper, entitled

MANIPULATION OF OXIDE.

The paper * read at our meeting, in 1890, by Mr. W. A. Learned, describing his method of revivifying oxide *in situ* by drawing air downward through the material, was a concise, comprehensive description of the system.

To the facts presented at that time I am now able to add a few from my own experience, and wish incidentally to describe a modification of the apparatus, hastily introduced to meet an emergency, which, in use, turned out to be, from the writer's point of view, an improvement on the system first adopted.

Revivification in the boxes was first attempted at the station under my charge in July, 1889, and has continued without interruption to date. Covering this period of 2½ years we have purified something over 1,000 million cubic feet without the removal of a bushel of the oxide from the boxes until its days of usefulness had departed.

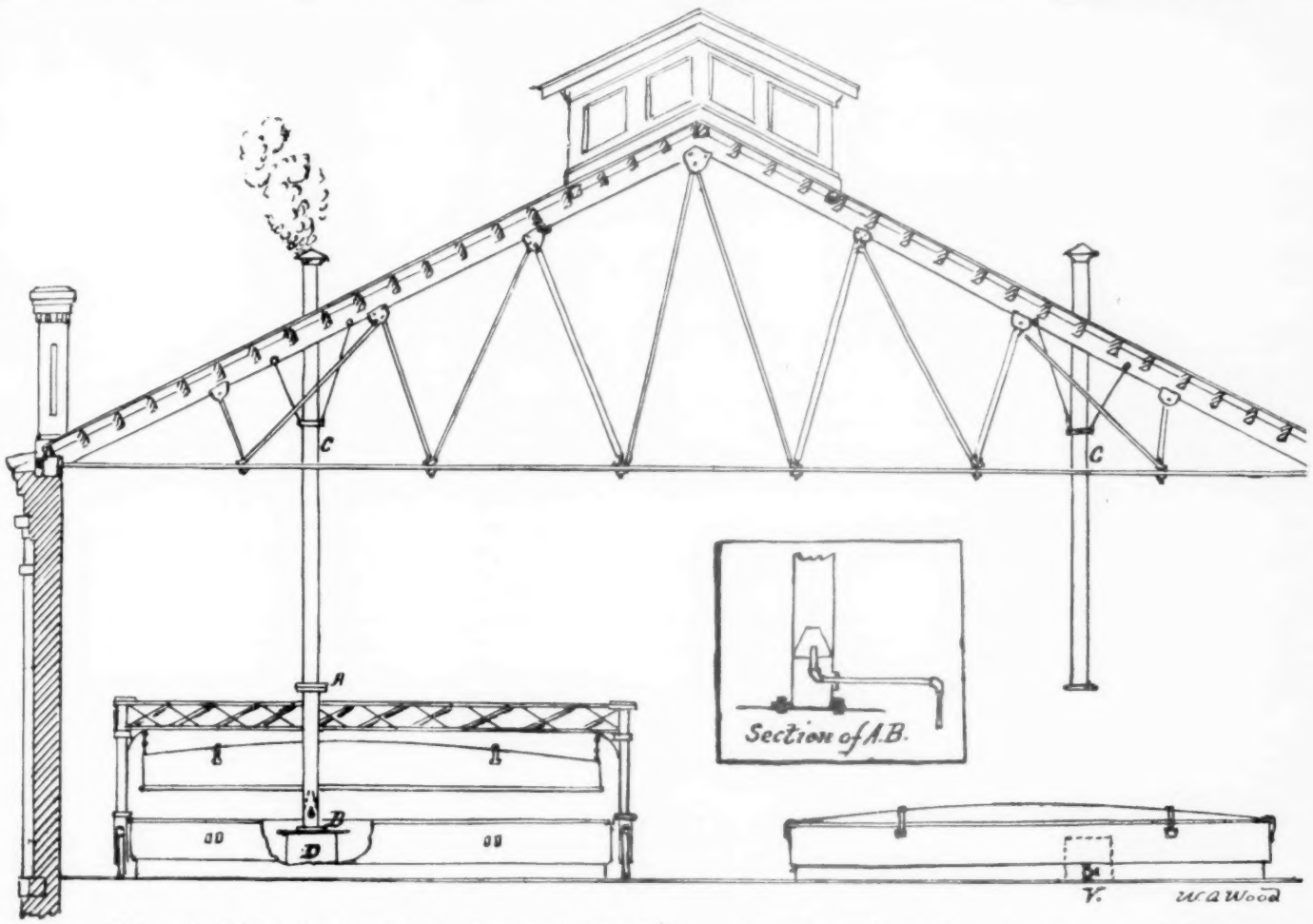
Experience has demonstrated that a moderate amount of water applied, through an ordinary spraying nozzle, on top of the material, assists oxidation, and that by a suitable adjustment of water supply and air blast the temperature of the heating mass can be controlled. One laborer has been found abundantly able to do all the work necessary to properly purify 1,000,000 cubic feet daily.

The present happy state of affairs was not attained without the preliminary trials and tribulations always attending the introduction of new methods. We had several fires, burned a number of screens and discharged some "accounted-for" gas through a 6-inch pipe into the open air, when a box was thrown in without closing the valve on the blower outlet.

With oxide of our own manufacture, costing from 12 to 14 cents per bushel, each bushel purifying from 90,000 to 120,000 cubic feet in its lifetime; with the removal of spent material by a chemical company at their own expense, combined with the low labor cost due to what I think deserves naming the Learned system, we are fast approaching the beatific altitude reached by the jubilant Western gas man who lately wrote the American Gas Light Journal that his purification the past month hadn't cost him a cent.

The purifying plant at Commercial Point, in 1889, consisted of four boxes 24 feet × 30 feet, rated at 1,500,000 cubic feet daily. Their capacity was fully tested that year by passing 2,000,000 feet; but with the blower in use we found the limit had not been reached, although changes were too frequent to permit of complete revivification, and the amount purified per bushel was small. A duplicate set was erected in 1890, and with doubled capacity the short days of '90 and '91 were anticipated with complacency. The short days, however, unexpectedly brought with them a scarcity of coal. The fitting out of the second set of purifiers was underway when the first cargo of Glace Bay coal arrived, and the condition of our sheds demanded its immediate use. The boxes fouled rapidly and the new ones could not be spared long enough to make the steam attachments to the inlets. The old set was made to do the bulk of the work until a point was reached where it would soon become physically impossible to empty and refill the new boxes and keep the gas clean. To meet the emergency the "Mother of Invention" evolved the contrivance shown in the photograph. In appearance it is not beautiful, but remembering the good turn it served, and knowing the good work it is still doing, its beauty, to the writer, is monumental. A length of 8 inch spiral, galvanized pipe, provided internally with a reducer and steam jet, which had served its time as a blower under a boiler, was rescued from the scrap heap. This was bolted to a circular plate 28 inches in diameter, with an 8-inch central opening. As soon as a cover was lifted, the "stove pipe," as it was christened by the men, was placed on top of the outlet pipe, and the jet connected with a ¾-inch steam pipe at the side of the box. Steam was turned on, producing a

* See Journal, March 10, 1890, p. 316.



vacuum on outlet, seal and inlet, thus drawing air downward through the material and blowing it out into the room. This was done at the expense of damp walls and ceiling until time was found to carry overhead connections outside the building.

From three to five boxes were changed daily, but we kept ahead of the procession until we were once more able to charge our retorts with good coal instead of sulphur.

The above experience has lead to the construction on paper (see drawing) of a somewhat modified device, which I consider preferable to the one first adopted, which was attached to the inlet.

Over each outlet, *D*, is suspended the pipe, *C*, proportioned to the area of the purifier and extended through the roof. The lower end is fixed at sufficient distance from the floor to permit the carriage to pass. Section *A B*, constructed as already described. Steam valves, *V*, can be so located with reference to each outlet that one short connecting steam pipe will answer for four purifiers, and this can be permanently attached to *A B*.

I prefer this to the inlet connection because everything is above the floor. There are no valves in the cellar to be inadvertently left open, and it is impossible to lower a cover and turn on the gas without removing the outlet cover—an act of forgetfulness of which every purifying house hand has to be guilty once in his lifetime.

The President here introduced Mr. Z. M. Jenks, of Woonsocket, R. I., who read his paper on

OXIDE PURIFICATION.

We are told that there is nothing new under the sun. Whether this be true or not, it is quite certain that something more than the bare statement would be necessary to convince the average gas man of its absolute truthfulness. My purpose in writing a paper on the subject announced is not with the idea that I shall be able to add very much to what has already been said about it, but because of some recent experiences which I have met with in connection with the use of oxide as a purifying substance, which, if they be not new to my hearers, were certainly so to me.

In the works at Woonsocket we manufacture water gas. The apparatus consists of a double four-foot set of the Granger-Collins type. After passing the scrubber and condensers the gas enters a relief holder, from which it is exhausted and passed through another set of condensers formerly used for coal gas, for the more effectual removal of any tarry compounds that may have escaped the other apparatus. It then enters the purifiers. These are four in number, 10 by 16 feet, with 10 inch connections, the gas being controlled by a Farmer center valve, which admits of either three or four purifiers being used together. The material used is what is known as the "Prince's paint mixture," and is prepared after the following formula: Sawdust, 20 bushels; lime, 10 bushels; Prince's paint, 8 bushels, or about 1,200 pounds; copperas, in solution, 300 pounds.

Prior to 1889 we had always purified with lime, either shell or stone; but owing to the constantly advancing price of the former, and the labor and inconvenience attending the use of the latter, we began to look about for something different. I was by no means an easy convert from lime to oxide, as I had been led to believe that the advantages attending its use were more than offset by the disadvantages; as, for instance, its liability to become overheated in the box, the loss of illuminating power owing to the presence of carbonic acid, etc.

We purchased the first lot of paint in the spring of 1886, but it was not until two years later that we made the first experiment with it. We at that time made up about 40 bushels of the mixture and placed it on the upper tray of one of our boxes, the others being covered with lime. When the box was again opened the material was removed and piled upon the floor, and the usual process of turning over at intervals was gone through with until it became revivified.

Satisfied with the results obtained in this small way, we purchased another lot, made up enough for a whole box, and continued to add in this way, a box at a time, until no lime remained in any of them. We were very careful to note the effect that might be produced upon the illuminating power of the gas, particularly when the last box containing the clear lime was turned off, but failed to observe any variation either way.

We continued using the mixture in the manner described for two years, with results most satisfactory, when we decided to try the plan of reviving the material without removal from the box, and accordingly fitted the boxes with 2½-inch pipe, in which was placed a steam jet, the scheme being to plug the outlet pipe and draught downward through the material and out into the open air. This, too, proved successful, and we were of the opinion that little remained to be desired so far as our purification was concerned.

Let me here state that our custom is to change purifier on the million, by which it will be seen that we frequently have, for a short time, at least two clean boxes. I mention this fact for the reason that what followed depended on this one point alone.

The system for reviving in the box was put in at a season when the output was the smallest—as a result of this it never happened that a purifier became foul before a million had been passed; but when the make began to increase the conditions became different, so that it occasionally happened that a box would foul before a million had gone through it. It was here that the climax was reached, for what was our astonishment when, upon changing purifier one morning, the candle power instantly dropped to a startlingly low point, and successfully resisted all attempts to restore it for several hours, when it gradually arose to the usual standard and so remained until it became necessary to again change purifier.

After our experience with the previous one it is needless to say we were on the lookout for what might happen at the next change; and we had not long to wait; for, sure enough, no sooner had we turned on the fresh box, when down went the candle power, and this time even lower if possible than before. It was about at this stage of the game that it would have been somewhat hazardous to have intimated to the writer that there was nothing new upon which shines our most glorious contemporary; but there was no time for theorizing, so I stepped into the purifying room and turned back the upper section of the center valve, thus bringing the fourth purifier (the foulest one) into service; the effect was magical, the candle power was restored at once, but alas! the gas was loaded to the muzzle with HS, the construction of the valve being such that the gas went to the foul purifier last.

We allowed it to remain so, however, for an hour or two, having discovered a point which we put into practice later. It was simply this: In both the cases alluded to where the loss of candle power was experienced, the box had fouled before a million had passed through it; as a result we, of course, had but one clean box at our disposal; so, after reviving the mixture in this box, we put it into immediate use, and by an arrangement of the valve caused the gas to go, first, to a clean box, then, through two that were more or less foul, and finally through another clean one, the object being to treat the material in the fresh box by passing a few thousand feet of gas through it, after which it was again shut off until such time as it might be needed, when the same operation would be repeated. Of course, it is easy to conclude that the whole trouble lies in the fact that this material, after being subjected to a continuous draught of air through it for a number of hours, undergoes a chemical change which leaves it in a condition to absorb very rapidly for a time a large proportion of the illuminants contained in the gas passing through it; but why it should do so in the case under discussion and fail to do it when revived by the old method of removal from the box is a question I shall be glad to have answered.

Joint Discussion.

Mr. Neal—Mr. Wood has passed around a photograph from an inspection of which we are led to suppose that before revivification the material is handled over. Is it not so?

Mr. W. A. Wood—The oxide was being handled on the day that photograph was taken; but in ordinary practice we do not handle the material in the box. That was taken at the time when we were using the Cape Breton coal, and we found that the material caked a great deal harder and sooner than it did when we were using the Pennsylvania coals. I think it has been the experience of all who have adopted this method that after you have made half a dozen changes it will cake more or less. I think, from the weight of the upper mass of material alone, it will cake next to the screen for several inches. It is our practice before there is any sign of the rise of pressure to throw the cake upon the top, break it up, and turn the loose material back upon the screens again. One man, as I have said, has been able to do all that labor for a million feet daily make. I do not wish to recommend every one to adopt this, and expect it to go without careful supervision, because several parties, who, having visited the works, looked at the system and admired it, afterwards said that they were in great distress from a trial of the system. I had a letter from a well known engineer a day or two ago, who saw the process last summer and was much impressed with it. He has always used lime because he gets it at a cheaper rate, but he thought he could do better with the oxide and he started to try it. I have had several letters from him since he started, and each one was more pathetic than the last. The last one said he had set himself afire, had thrown out the material, and had gone back to lime. I think we were particularly fortunate in the material we started with; and I must say it is my belief that the sawdust itself may make a difference in the ease of firing—perhaps owing to the stage of dryness when mixed up. I am led to believe this because my experience is that, among members who have fitted out exactly alike and under the same conditions, one will go along without any trouble, while the other will "set himself afire" right along. I do not know how to account for the difference unless it be owing to a difference in the material in the mass. I have run up as high as 150,000 feet, and our figures on the average are 100,000 to the barrel in the lifetime of the material.

Mr. Stiness—Do you use wrought iron or cast iron borings?

Mr. W. A. Wood—We always use cast iron.

The President—What purifying material does Mr. Lamson use?

Mr. Lamson—Oxide of iron.

The President—Have you done anything in the way of revivification in boxes?

Mr. Lamson—We take out the material, turn it over and then put it back.

Mr. S. F. Hayward—As a guest, may I be allowed to ask a question? I am particularly interested in this subject, and I would like to ask Mr. Wood if any offensive odor comes from the pipe, sufficient to make any complaint on that score?

Mr. W. A. Wood—We have never had any complaint from that source. The pipes are all connected, so that they go right up through the roof. That is the system recommended; but we carry them out of the window. We take a pane of glass out of the window and run the connecting pipe outside the building. I have tried the blast several times with lead paper. After running a few moments you cannot get any show of sulphureted hydrogen on test paper at the outlet of the blast pipe.

Mr. Stiness—There are no offensive odors in the neighborhood?

Mr. W. A. Wood—We have had no complaint.

Mr. S. F. Hayward—I have an idea that in most cities they will have to come to this process of revivification, and abandon lime; using this manner of revivifying in boxes. I understand that the Standard people in New York have had a good deal of trouble with the Board of Health on the question of odors; and they have undertaken to remedy the odors by revivifying the sponge in the boxes. I understand they are running their pipe directly to the flue of the boiler and carrying it off far enough in that way. I would like to ask another question—in regard to the heating up; would it not be possible to hang the thermometer in the boxes, and regulate the flow of air in there, and thus keep the temperature down?

Mr. W. A. Wood—It has been my intention to make experiments with a thermometer, but it is something we have never yet done. The thermometer that we have used is the arm of the man who runs the purifying house. He runs his hand down into the material, and if he finds it too hot for him to keep it there long, he turns on more air.

The President—Perhaps I did not quite hear what Mr. Wood said with regard to spraying the material. I did not clearly understand that.

Mr. W. A. Wood—The sponge gets very dry after you have blown air through it several times, and the water is, of course, essential to the reaction.

The President—To what extent?

Mr. W. A. Wood—We regulate it in proportion to the heating up. If the air-blast is not cooling it off sufficiently rapid for us we add water.

The President—In conversing with different engineers I find there seems to be a diversity of opinion as to how much moisture ought to be applied to the oxide to get the best results. Some seem to think it ought to be so thoroughly wet that it will ball together when you hold it in the hand; others think it should have just enough moisture to keep down the dust.

Mr. W. A. Wood—We try to give it what water the material will take up, without running any great amount of water through the screens.

Mr. W. A. Learned—I would like to ask Mr. Wood what the cost of his labor is per thousand feet; also, what vacuum he has upon the purifiers, and what amount of steam in pressure he applies to his steam jet exhauster? In relation to this matter of odor, I think that in a thickly settled town or city you would experience trouble if the pipe was not extended up through a high chimney. At our place we are located in a hollow, and on the street back of us, about thirty feet above the works, when the wind is in the right direction, the odor is noticeable—in fact it is very perceptible—and I dislike it very much; but we have not yet had any complaints from it. Of course if we were to put in a large chimney we would get rid of it in that way. The reason why I ask Mr. Wood these questions is simply this: We are running on seven pounds pressure of steam and getting half an inch of vacuum upon our pan, and are able to do the work more effectually in about five or six hours.

Mr. W. A. Wood—We do not carry so much vacuum as that—never over quarter of an inch, and generally not over one-eighth of an inch. We try to run the air slowly through our boxes, which are very large, and there is considerable capacity to an eight-inch blower. With regard to the cost of labor, we make up our figures for a given length of time by giving a certain value to the old material in the boxes, according to the time they have been in use, adding to that the cost of all new material purchased for the year, the labor in the purifying house and everything that we can legitimately charge up. The cost of new screens and everything of that sort goes into the purification account. At the end of the year we take an account of stock on hand, and the difference is divided by the amount of gas made. I expected to be asked some such question as that, but I would not like to give you my figures for the year, as the purifiers have been run to but one-quarter of their capacity, which, of course, makes the cost abnormally low. I do not think such figures would be fair. I will say, however, that, basing it on what we have actually done with the apparatus, it is within bounds to say that the total cost of purification (excluding the cost of steam to run the blower, which I have no means of determining, because we take the steam from the main boilers, and they are run mostly on breeze, which is a drug with us) by this method should not exceed .33 of a cent, of which you can figure two-thirds as labor and one-third as material—that is, basing the cost of material at from 12 to 14 cents per bushel. Of course, that will vary with the cost of your iron borings and the cost of your sawdust. We are very fortunately situated in regard to obtaining those materials. You can see that the labor cost is very slight, for one man can take care of and do all the work, excepting the work necessary in calling a man in to help lift the covers, which with us occurs perhaps once a week.

Mr. S. F. Hayward—May I also ask Mr. Wood if he has ever tried the plan of drawing in with the gas at the time of purification a certain percentage of air, and thus producing revivification at the time?

Mr. W. A. Wood—I have tried it in an emergency.

Mr. S. F. Hayward—With any degree of success?

Mr. W. A. Wood—Yes; for a very short time, or until we could manage to get a clean box ahead. I do not believe in running in that way. It can be done—there is no difficulty in it—in letting a little air in at the exhauster; you can do that, and keep the gas free from sulphureted hydrogen until such time as you can work the other way; but I do not favor it except in an emergency.

Mr. S. F. Hayward—What percentage?

Mr. W. A. Wood—I think about 1 per cent. will do it.

Mr. Neal—What is the effect on the candle power?

Mr. W. A. Wood—It does not help it any.

Mr. Sherman—Twenty years ago I tried the process of revivification in boxes at the Worcester works, but had to abandon it on account of the nuisance which the odors made in the neighborhood. I used to work it nights, but people sometimes would have their windows open at night, and they would complain. In the daytime they would not tolerate it.

Mr. Gifford—I would like to ask any of those who have been making their own oxide whether they have had trouble with any special kind of wood put in. The first batch that I made, using pine sawdust, worked all right except that it took fire occasionally. On a second batch, using planer chips, which took in every kind of wood, I found it rather difficult to get the color back. I did not know but there might be some panic or pyrogallic—something which made a solid compound.

The President—In our experience we have noticed no difference as far as the purification went; but we have had considerable difficulty in getting sawdust that was as coarse as we would like it. The coarser the sawdust the more readily will gas pass through it. We finally found a concern down in Maine (I forget now the name of the party) who makes a business of putting sawdust into sacks, pressing it like bales of hay, and delivering it on the cars, so that it nets about $1 in Boston. That will make some 30 bushels when it comes to be opened. It is pressed very compactly. It is the best sawdust that I have been able to find for the purpose.

Dr. Amory—Is that poplar wood sawdust?

The President—No; I think it is pine.

Mr. Sherman—I would like to ask Mr. Wood how much carbonic acid he sends out in his gas, if any.

Mr. W. A. Wood—The gentleman will have to call on the State Inspector for that information. We mix our gas with the gas that comes from the water gas station. It all goes into the holder together. I have not had our gas analyzed for carbonic acid for a long time, and I cannot tell what the percentage is. We take no account of it, because we use practically no other enricher than water gas.

The President—Mr. Jenkins seems to be desirous of getting some advice or sympathy.

Mr. Bush—In listening to Mr. Jenks' paper, in the matter of the composition of the oxide, I noticed that he puts in lime. I would like to ask him just the part which the lime takes in the iron sponge—the chemical action; and whether it is considered necessary.

Mr. Jenks—Prof. Harris was, I believe, the first man who tried this mixture. I wrote and asked him the same question, and we corresponded for quite a little time on that subject. I was totally unable to get from him any reason that appeared to me a good one for putting lime in. I have spoken with quite a number of engineers about the matter, and some have suggested that it might be intended to liven up the material so that it would not be quite as soggy as it would otherwise be. I am unable myself to answer that question. I really cannot see any sense in it. I do not see what good that lime is after it has been used once.

Mr. Bush—I think that lime, after the sponge has been once used, would be an injury. It would simply be in a foul state in the sponge. I should say that something like ammonia, or ammoniac chloride, used when the sponge is first made, would be a much better method of oxidizing the iron.

Mr. Jenks—As far as the oxidation is concerned this material works admirably. You would have no reason to question that it is a good oxide. It takes care of the sulphur in good shape. Up to the time of propounding this conundrum I was very much pleased indeed with the working of it. I have privately presented this question to two or three of the engineers of this Association who, being technically educated, ought perhaps to be able to answer a question of this sort; but they gave it up. One of them said that I had struck a new kind of bug. If this had only occurred once I would not have presumed to have brought it before this convention. The experiment itself demonstrated to my entire satisfaction that you lose candle power on a change like that, whereas, if I may use the term, if we carburet the material for a number of hours in the purifier and then turn it off, when it comes time to change again that purifier acts all right and will take the sulphur out, and do it with no loss of candle power. Otherwise it will drop down when passing 6,000 or 7,000 feet per hour through the box, and will remain down for 5 or 6 hours.

Mr. Greenough—How much will it take it down?

Mr. Jenks—It will take it down from 20 candle power to 14 candle power. I think Mr. Lamson uses this material in Worcester, and I would like to know if he has had any trouble from it.

Mr. Lamson—I do not think we have had any such trouble. When they first turn on the boxes I believe the candle power is a little less, which is due to the amount of air in the boxes.

Mr. Jenks—That is the natural expectation.

Dr. Amory—This is a chemical question, and must have something to do with some very unstable organic compound which takes hold of the hydrogen in the gas. A chemist would solve the question by analyzing the volatile substances which may be held in the gas as an organic chemical radical, and which will absorb hydrogen very readily. I think that is the proper way to look for a solution of the problem.

Mr. Jenks—This has all occurred within two months. My intention is to go into the subject more thoroughly, and to find out if possible by chemical analysis what the trouble is.

The President—I was about to suggest to Mr. Jenks whether it would not be a good idea for him to change his iron material and get clean cast iron borings. That "paint," as he calls it, may contain something which prevents the proper revivification in the boxes.

Mr. Jenks—I think the very opposite is the case; and that the work is overdone. My thought about that is, that by revivifying in the ordinary way (taking it out of the box and piling it up, and shoveling it over and over) the revivification does not take place to the thorough extent that it does when revivifying in the boxes; and I think the apparent condition of the material would substantiate that view. I am sorry I did not bring down a bottle of it.

Mr. Goodno—I think with regard to the action of the lime in the sponge which Mr. Jenks made, that the suggestion that the lime becomes inactive after one or two uses, is erroneous. If you bring copperas water in contact with slacked lime, you will find that it will immediately make hydrated oxide of iron, which is the active constituent in all sponge; and that is the same substance which is made, after a time, by mixing iron borings, water and sawdust. Thus it will be seen that the lime is at once lost as lime, but is retained indefinitely as a purifying material in another form.

Mr. Gifford—Has anyone looked for or found true sulphuric acid in the oxide?

The Secretary—Yes.

The President—Perhaps the Secretary will give us more particulars.

The Secretary—We all know that when we put our hands in the oxide, we find them discolored ; and I always supposed that it was with the sulphuric acid.

Mr. Gifford—There is other coloring matter there besides that.

Dr. Amory—How can that be, if there is free ammonia in the sponge.

The Secretary—Then what is the discoloration ?

Dr. Amory—That is due to some organic substance.

Mr. Sherman—Mr. Isbell can give us some information, I think, on the question of how to get rid of the foul odors from the purifying house during the changing of boxes. I think that he fitted up some kind of apparatus which was effective.

Mr. Isbell—We put in a steam jet exhauster and connected it with an independent opening to each one of the boxes, and so arranged the valves that either box could be worked at pleasure when the cover was lifted, and passed the odors which we drew down through the lime. By the way, I am going a little too fast. I ought first to say that before you start the steam jet exhauster you want to lift the covers, or else have good sized vents attached to them, and then start the steam jet exhauster and let the air be drawn down through the lime. The outlet of the steam jet exhauster we had attached to a condenser. In fact we had two condensers ; one of which was filled with lime and the other with brush or twigs. Through the brush condenser there was quite a stream of water flowing which washed out whatever impurities water will take, and the rest of them were discharged into the open air after passing the lime condenser. Sometimes we take them to a furnace, or to some chimney stack if there is one convenient. But in this case we discharged the odors (after they had been treated as I have described) into the open air ; and I think we must have done the work effectively, as we worked under the supervision of Prof. Chase, of Brown University. He was the party employed by the gas company to determine whether we had properly carried out our contract ; and after the expiration of the test he advised the Providence Gas Company to pay us our money. So I suppose that we did the work thoroughly and effectively.

Mr. Stiness—Are you using it now ?

Mr. Isbell—No ; not that I know of.

Mr. Stiness—There was a crank there who made complaint because they had foul odors. But it didn't amount to anything ; and he got over it.

Mr. Isbell—I believe he died, as there was nothing left to complain about. (Laughter.)

Mr. Sherman—There is one point with regard to the purification by iron that I have not heard mentioned, and which is very much to its advantage, especially where companies are working under statutes which limit the amount of ammonia in their gas. I found when I was working it in Worcester that we had little or no ammonia in our gas. I think there is where our English friends get rid of their ammonia. From their report it will be seen that the gas is entirely free from ammonia, and I take it that it is owing to the fact that they use iron purification.

On motion of Mr. Neal a vote of thanks was passed to Messrs. Wood and Jenks.

Report of Committee on President's Address.

Mr. Lamson, of the Committee on President's Address, presented the following report, which was, on motion of Mr. Stiness, adopted :

Gentlemen of the New England Association of Gas Engineers :—Your Committee have received the interesting and practical address of your President, and would recommend to each member of the Association that he carefully study the various topics touched upon.

We understand that a committee has been appointed to draw suitable resolutions on the death of our deceased member, John Andrew, as suggested by the President.

We would emphasize the remarks in regard to increasing the sale of gas, and the suggestion of employing the same means to that end that are used in other lines of business.

We would especially recommend that the advice to the younger members of the Association, in the latter part of the address, be thoughtfully and carefully studied by not only the younger men, but by all the members of the Association.

Charles D. Lamson,
H. B. Leach,
Charles H. Nettleton, } Committee.

Mr. F. C. Sherman, of New Haven, Conn., read his paper on

Results Obtained with Deep Furnaces.

Two years ago we had occasion to rebuild a stack of benches and the question of furnaces and settings had to be solved. I had given this subject considerable thought, and had plans and estimates made seven years ago for a new retort house and full depth regenerating furnaces, with settings of 9 retorts to a bench, at an estimated cost of $100,000. Subsequent investigation and inquiry satisfied me that the adaptation of this system to retort heating was still in its experimental stage. While the theory of regenerative gaseous heating of retorts is the correct one, the successful application of this method of heating is not so simple a matter as may at first sight appear. I found, with few exceptions, that those who were using this system were not fully satisfied with it ; they suggested changes and improvements. An engineer of large experience and great ability, and in charge of one of the large works of our country, and who has tried about every regenerative system that has been introduced in this country, told me he was all at sea on this question, and could not fully indorse any system he had tried. Meanwhile, experiments are being made by the large companies, the cost of which would ruin a moderate sized company, in the direction of perfecting the details of the system ; and in time success will be arrived at.

A serious objection to the introduction of this system of firing into small works is the intelligent care and attention required to get successful results—an intelligence that is not found in the ordinary stoker. In the present restless and disturbed condition of the labor question, the labor unions will see that the companies get no advantage by the introduction of this system. If the retorts work off more coal, more help will be demanded to handle it. The undoubted saving of coke made by regenerative firing is offset by the reduced rates it must be sold at. On the seaboard coke cannot compete with anthracite coal for domestic purposes, and the bulk of it must be sold for steam purposes in competition with soft coal, and that means here less than $3 a ton for coke delivered to the consumer. The capital outlay for regenerative furnaces and a stage firing house would be more than double that required for ordinary furnaces. Under these conditions, I did not feel it was advisable to go into this system of firing our retorts. The alternative was to put in deep furnaces, drawings of which are before you. Here we are, in a measure, handicapped by the shallow depth our works are laid out above tide water line, being only 5 feet 7 inches from retort house floor to water line. This gives us a depth of furnace, above grate bars, of 4 feet. This is too shallow for best results, but was the best we could do ; 5 or 6 feet depth would be better. We laid out the arches 8 feet wide, 12 feet 11 inches from ash pan to crown of arch. The furnaces are 5 feet 3 inches long, 16 inches wide and 4 feet deep, with openings on the top for the introduction of air. At the bottom we introduce steam. In our arches we put 6 retorts, 15 inches by 30 inches, by 9 feet 8 inches in length. These benches have been in use 14 months, and are in good condition, considering time in service. The average results obtained have been a yield of 10,700 feet per retort (including time lost in removing carbon) from Westmoreland coal on a consumption of one third of the coke made. The average charge has been 347 lbs. per retort, every four hours. There are several styles of deep furnaces on the market. The Dieterich, the Flemming or Snow, or any of them, will give uniform heats, with a consumption of one-third of the coke made. I have used successfully the Flemming. All that is required in any of these is depth of fuel and a proper admission of air.

Discussion.

The President—The paper is before you, and I hope you will ask Mr. Sherman as many questions as have been asked about revivification.

Mr. Stiness—I like Mr. Sherman's paper, but I cannot agree with his views in respect to full-depth regenerative furnaces—that is, that their use requires remarkably skilled labor. I have used the Dieterich furnace for about 10 years and was not aware that I had been employing anything more than the common help that comes from the Emerald Isle ; and certainly, for that period of time, the Dieterich furnace has given me the most perfect and complete satisfaction. The retort house floor with me is on the ground level. I have a basement, and there is a way out of that basement to wheel the ashes. I have questioned many times the building of this stage floor where everything must be lifted, as the basement is used simply for the taking out of ashes. With us it is a very small cost indeed. We are situated within 50 feet of the harbor line, where we have 4 feet 9 inches rise and fall of tide, and are never troubled with water in the basement. I have examined the Snow and the Flemming half-depth regenerative furnaces, and, of course, I can see that they are very excellent, and where the full depth cannot be used I suppose they are just as good. As to requiring extraordinary

and high skilled labor for the Dieterich furnace, I must say I have never been obliged to do it.

Mr. Sherman—My remarks with regard to that furnace do not apply to your furnace. Yours is a generator furnace, and I had reference to a regenerative.

Mr. Harbison—I must take issue with Mr. Sherman in this matter. We have a stack of Stedman-Stanley furnaces on the stage floor, and do not agree with Mr. Stiness that the place to put them is underground. Our cellar floor is on the ground level, and it is low enough for the comfort of the men. They want a reasonable amount of fresh air, and they ought to have it. We have not been called upon to pay any higher wages to the men because they were using this style of furnace; and we have very much the same class of help that Mr. Sherman has. I am not willing either to let it go, by simply passing it, that coke is only worth 4½ cents per bushel. Mr. Sherman is making water gas in part, and his coke is worth a great deal more to him to use than 4½ cents per bushel. With anthracite coal worth $5.25 in our sheds, coke is worth 9½ cents per bushel for use in our generators. We have used it largely during this winter when we have had a surplus.

Mr. Sherman—I am not speaking in connection with carrying it on with water gas, but our people have to carry it on on commercial principles and sell the coke.

Mr. W. A. Wood—I have been a little surprised at the idea, which seems to be current, that it takes more skilled labor to run the full-depth than it does to run a half-depth furnace. I have always supposed that half-depth furnaces were only put in where it was impossible to put in a 2-story house, or because of a poor foundation, or on ground affected by tide water; and I asked this morning why, with a 2 story house at Brookline, the arches were bricked half-way up and furnaces put in only half-depth. I asked Dr. Amory the question, and his reply was that it would require less skilled labor to run them. I have had some experience with all kinds of furnaces—with the ordinary half depth furnace, and with furnaces which could hardly be called half depth, because they only went down 3 feet below the retort house floor. My experience has been that the same kind of labor would work either kind of furnace, and that the full depth regenerative furnace is the most economical to run by all manner of means. You can run six or eight furnaces with one man, and I do not think that you can run half depth furnaces with any less number. The question of recuperation has nothing to do with it. You can have just as little with a furnace 8 feet deep as in one 4 feet deep.

Mr. Sherman—What do you mean by half-depth? How many feet?

Mr. W. A. Wood—I asked Dr. Amory why he put in half-depth furnaces. He went down half the distance between charging floor and ground line.

Mr. Sherman—How many feet of fuel will that give?

Mr. W. A. Wood—I do not think there would be more than 3 or 4 ft.

Mr. Sherman—I suppose that half-depth meant where people did not have space to put a deeper one. In my case I would have gone down deeper were it not for the tide water.

Mr. W. A. Wood—That is the point exactly. He called them half-depth furnaces, and instead of carrying the furnace down where he had room, he would fill up between the arches, and the ash pan was put half way between the cellar bottom and the floor above. That was a mystery to me. The statement being repeated here that it took more skilled labor to run a full-depth furnace than a half-depth, led me to ask the question. A shallow furnace, other things being equal, will certainly require filling oftener than a deep one.

Mr. Sherman—You have got to have men with sufficient intelligence to look after the dampers and the drafts. With every change of wind the draft to a full regenerator recuperative setting requires to be changed. You must have a fireman of more than ordinary intelligence to get successful results where all those details have to be looked after. Then, again, it is a furnace which is simpler in construction.

Mr. Nettleton—I dislike to take issue with Mr. Sherman, but I think that this is one of the cases where the surrounding conditions must determine the style of furnace to be adopted. In works the size of Mr. Sherman's, and with the market that he has for coke, undoubtedly his conclusion is the correct one; but in smaller works, say under 50 millions, where the manager can give more personal attention to furnaces, and where the coke can be disposed of readily, I fancy that it is economy to put in a furnace that will burn the least quantity of coke. From my own experience I do not regret the conclusion that led us to adopt advanced furnace firing at Birmingham. We have a good market for our coke at a good price, and make gas cheaper than we ever did before.

The President—I think that Mr. C. J. R. Humphreys has something to say on this subject.

Mr. C. J. R. Humphreys—I cannot add anything of value. We are running a couple of full-depth furnaces, but I really do not know what they have been doing for the past year, and do not think that I can state it to any good purpose.

On motion of Mr. Leach the thanks of the Association were voted to Mr. Sherman for his paper.

Votes of Thanks.

The President—One matter that we have overlooked is in reference to sending some communication to Mr. Jones in acknowledgment of his very kind letter, and also of the collection of photographs which he has sent us. Again, before Mr. Jones' departure for San Francisco, he placed in my hands a set of experimental purifiers made by him at considerable expense. They are of very perfect size, although small, and have all the necessary connections, including a Guy's center seal. He wished me to present them to the Association, and ask you to make such disposition of them as you saw fit.

Mr. Stiness—What is the size?

The President—I think they are a foot in diameter each way, and 3 feet in depth. They are connected with regular meter coupling connections so that they can be very readily connected or disconnected with the center seal. It occurred to me that it would be desirable to place these purifiers in the hands of one of our younger members who had received technical education, and they might give us some valuable information as the result of experimenting with them in the purification of gas.

Mr. Harbison—I move you that Mr. Jones be suitably thanked by the Secretary, in behalf of the Association, for his kindness to the Association in making the gift; that his gift be accepted with thanks. The Secretary will understand how to cover it in a concise way. Also, that the purifying boxes be placed in the care of the Secretary, with permission to put them at the disposal from time to time of any one who may be willing to make experiments for the benefit of the Association. (Adopted.)

The President—The business mapped out for this meeting of our Association has all been attended to, and I know of nothing that remains but to adjourn. I wish to thank the members heartily for their very prompt attendance and attention at our meeting, and I bespeak the same treatment for my successor.

Mr. Harbison—This Association has been in existence for more than 20 years, and during that time (with perhaps the exception of two sessions) the deliberations of the Association have been presided over by men of great ability; and our meetings have been notable for the good order maintained, for the strict attention given to business, and for the good feeling existing among the members. This is largely due to the presiding officers; and this term has been no exception to those that have gone before in that respect. We can all testify to the very able manner in which the deliberations of the meeting have been guided by the conservative good judgment and ability of our retiring President. On behalf of the Association I move that a vote of thanks be placed on record to the President for the very able and efficient manner in which he has presided over our deliberations, and ask the President-elect to call for a rising vote on this question.

President-elect Wood—Gentlemen, you have heard Mr. Harbison's motion. All who favor it will rise. It is a unanimous vote.

President-Allyn—I thank you for your kind vote. You all know the difficulty under which I have labored, and that at one time it was extremely doubtful whether I could meet with you again—even when I became convalescent it was very doubtful whether I should be able to be present at the meeting. I am very happy to have been with you, and glad that we have had so successful a meeting.

Mr. Lamson—I move a vote of thanks to the Secretary for the manner in which he has attended to and carried out the details of this meeting.

The President—If Mr. Lamson has no objection I would like him to include in his motion a vote of thanks to our President-elect, for it has been a sort of joint-stock arrangement.

Mr. Lamson—I will include both gentlemen.

The President—It has been moved and seconded that a vote of thanks be tendered to Secretary Prichard and to President-elect Wood for the efficient manner in which they have arranged the details of this meeting. (Adopted.)

Mr. Egner—I would like individually to have my thanks recorded as an expression of my gratitude to this Association for the cordial manner in which I have been received here. I have visited a number of meetings of other Associations, and I wish to say now, as you are about to close, that I have never felt so much at home at any other meeting, except those of the Western Gas Association, as I have felt at this meeting

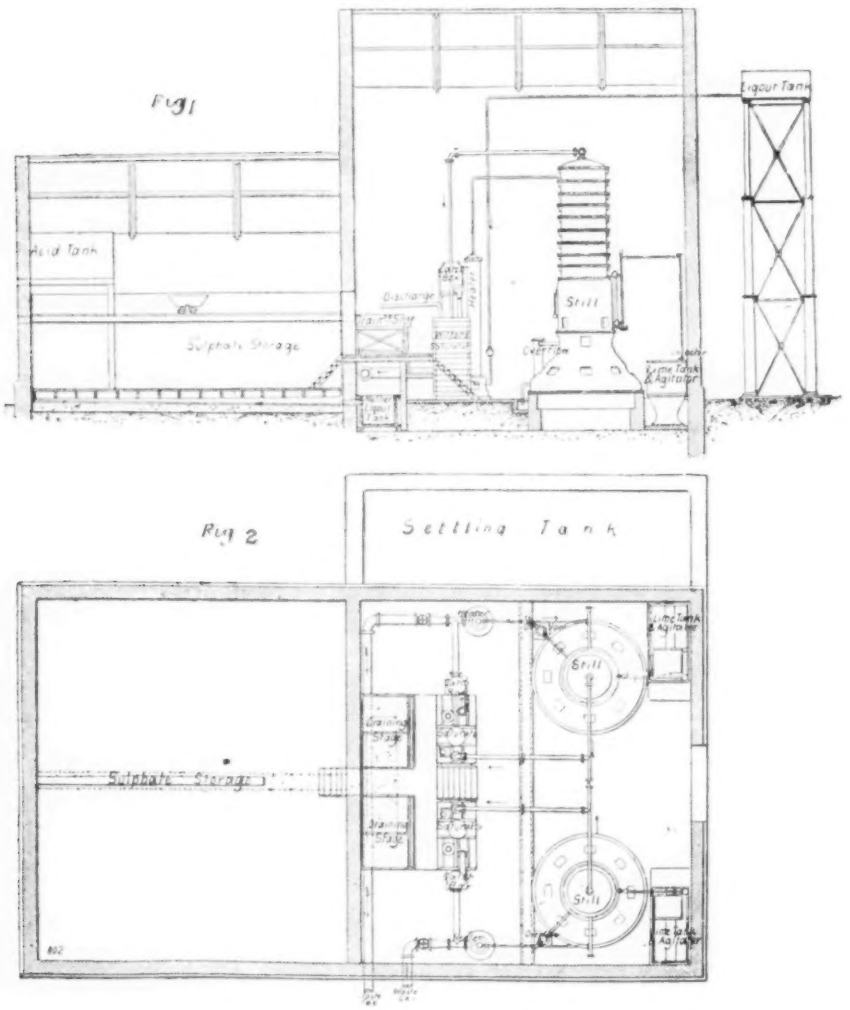
of the New England Association. I want to thank you all for the very kind manner in which I have been received. I have gone to other Associations, and have been a stranger there until I was made a member, but here I have been made at home, and have felt very much at home. I hope to see many of you at Detroit. A number of the shining lights of the New England Association are Honorary Members of our Western Association, and I hope that they, and many others of your members, will meet with us at our next meeting, in Detroit, on the third Wednesday of May.

The President—We have all been very happy to have Mr. Egner pay us this visit, and trust that it will not be his last.

The Association then adjourned.

Sulphate of Ammonia Plant, Manchester Gas Works.

The engravings illustrate a sulphate of ammonia plant supplied by Mr. Henry Simon, of Manchester, to the South Metropolitan Gas



Works, London. The process of manufacturing sulphate of ammonia combines three different features:

1. The distillation of the ammonia contained in the gas liquor.
2. The absorption of the ammonia gas in sulphuric acid.
3. The treatment of the waste or noxious gases evolved during the process of manufacture.

The ammoniacal or gas liquor to be worked up is continuously pumped from the liquor well into an overhead tank, placed about 33 feet above the ground level, whence it flows by gravity in a constant stream through liquor heaters (described below) into the top of the two ammonia stills.

Each ammonia still is a self contained and complete apparatus in itself, and consists of three essential parts: the lower, in which the volatile or free ammonia is driven off, the lime vessel in which the fixed ammonia compounds are decomposed and liberated, and the boiler in which, by means of a stepped cone and steam coil, the last portions of ammonia are expelled. The tower has a series of chambers fitted with internal trays and overflow pipes. The fresh gas liquor, entering at the top of the tower in a continuous flood, encounters the stream which travels in the opposite direction; as the liquor passes downward, gradually becoming poorer in ammonia, it always meets steam, until it leaves the last chamber entirely free from its volatile ammonia compounds, and enters through a bye-pass to the lining vessel. Here a certain quantity of milk of lime is introduced, and intimately mixed with the liquor by the action of the steam entering the lime vessel through numerous inverted pipes and keeping the liquor in constant ebullition.

The milk of lime is prepared in a large cast iron V-shaped tank, fitted with a steam agitator, which keeps the milk constantly stirred up. The lime is supplied to the lime vessel by means of an injector. In the center of the lime vessel is a large overflow pipe forming the communication with the bottom part of the still, the boiler. In this there is arranged a stepped cone over which the liquor flows; in consequence of the increased area of each step, the surface of the liquor in flowing downwards becomes larger and larger, thus permitting the passing steam to act upon it very thoroughly and to set free the last traces of ammonia. The live steam is admitted through a perforated coil placed at the bottom of the cone. We have thus a current of ammonia mixed with steam continuously passing away from the top of the still, whilst the spent liquor flows off at the bottom through a hydraulic overflow pipe.

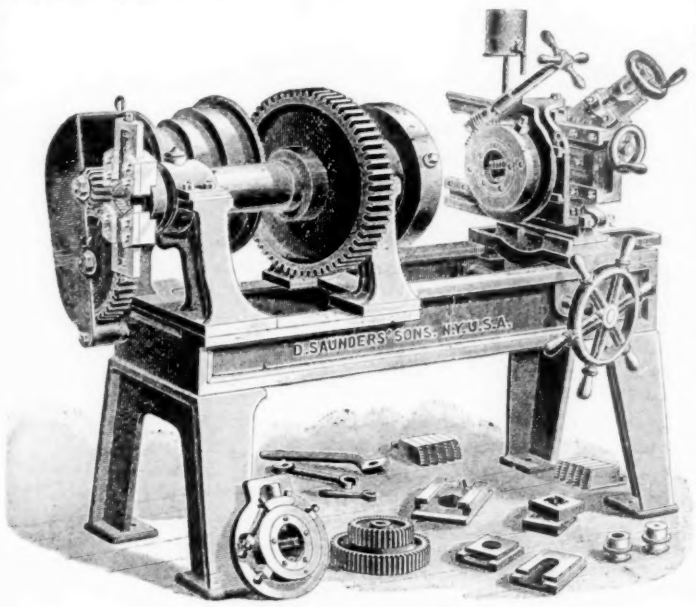
The absorption of the ammonia in sulphuric acid is effected in an apparatus called the saturator. It consists of a wooden closed tank lined internally with lead, containing diluted sulphuric acid, into which the ammonia from the still is led. The ammonia readily unites with the acid, and after a certain time forms a salt (sulphate of ammonia), which deposits at the bottom of the tank in a well, from which it is lifted and discharged on a draining table by Wilton's patent automatic sulphate discharger. The mother liquor draining off the sulphate runs back through a pipe into the saturator. The sulphate, after having been primarily dried on the table, is conveyed in small trucks to the adjoining storage building. The waste gases are evolved in the top of the saturator, and consist chiefly of carbonic acid and sulphureted hydrogen. It is compulsory, according to the Alkali, etc., Works Regulation Act, to deal with these gases in such a manner that they create no nuisance or damage to the surroundings, when passing into the atmosphere. For this purpose the hot gases (about 220° F.) from the saturator are led into a leaden catch-box, in order to retain the heavy particles of sulphuric acid carried over along with the effluent gases; thence the latter are passed through a liquor heater, which serves two purposes, namely, to cool the gases and at the same time utilize their heat for warming the gas liquor before entering the ammonia still. The heater is made up of a cast iron shell containing numerous tubes, through which the liquor flows; the gases surrounding the tubes warm the liquor to a temperature of about 140° F., at which the ammonia evaporates. The heater stands on a cast iron base, which serves as a depositing tank for the pitchy and other impurities contained in the liquor.

The above described apparatus are arranged inside the sulphate house and the gases are further treated in a separate plant placed outside the building. This plant has been designed by Mr. F. Livesey, the chief engineer of the company, and mainly consists of large condensers, cooling pipes, and oxide purifiers, but in addition a sulphur recovery plant has been erected in which the sulphureted hydrogen is decomposed by burning it with a limited supply of air. The hydrogen forms water, while the sulphur is condensed and deposited in a brick chamber and in a condenser formed of earthenware pipe. After leaving the chambers the gases pass, first, through a lime tower to neutralize any sulphurous acid, and then through oxide of iron purifiers to eliminate the remaining traces of sulphureted hydrogen. They are then discharged into the atmosphere.

Saunders' Pipe Threading and Cutting Machine.

The illustration represents an apparatus put on the market by Messrs. D. Saunders' Sons, of Yonkers, N. Y., for cutting off and threading steam and gas pipe. The belting and gearing have been arranged with a view of obtaining suitable power and speed for the various sizes of pipe, and the arrangement is claimed to be superior to most others in

use. The die shown in place on the machine is adjustable and expanding, operated by cam slots to open and close the chasers. The die and head to which it is attached are so constructed that pipe may be alternately threaded and cut off without removing the die from the machine. The die being on the front of the cutting head can be brought close to the gripping chuck, and short pieces of pipe can be threaded. This advantage often saves the use of a nipple socket. When the pipe is to be moved in order to adjust it for cutting off to any length, the die and plate it is attached to are pushed to one side upon ways, allowing the pipe ample room to pass through the cutting head without passing through the die. It is said that this improvement is found in no other pipe threading machine.



The cutting off tool is convenient, and is operated by the upper hand-wheel. The hardened steel jaws are used for steadying the pipe while cutting it off. They are operated by a right and left-hand screw, centering the pipe.

The jaws are adjustable to compensate for wear. The universal gripping chuck for holding the pipe is strong and well fitted. On the rear end of the spindle there is a self-centering two-jawed chuck for steadying the pipe.

The machine is well designed and adapted to the work it is intended to perform.

Illuminating Flames.

[A Lecture Delivered by Prof. Vivian B. Lewes, F.I.C., F.C.S., before the London Institution.]

Flame has always had an attraction for us which has been rivalled by few other natural phenomena; and whether we look back to the times when the old Fire Worshippers treated it as a deity, or take the present century and trace the work which has been done and the discussions which have been held as to its cause, and the actions which render it luminous or destroy its light-giving power, we are fain to admit that a subject which has drawn to it so much attention for upwards of 20 centuries must be a worthy object for research, until such time as we have mastered every detail that bears upon the subject. It is upon flame that we have, up to the present, always depended for artificial illumination; and whether that flame has been derived from the torch, the rushlight, candle, oil-lamp or coal gas, it has played a part second to none in our domestic comfort; while with the birth and development of coal gas in the early years of this century, flame became an important commercial factor in the history of the country. It was not until the waning years of the last century that Lavoisier's historical researches upon combustion gave us the key to the action which leads to the formation of flame; and since that time its history has teemed with important researches, and still more important applications, which have to-day borne fruit in the improvements we see on every side in our methods of utilizing flame for both heating and illuminating purposes.

Flame, be it luminous or non-luminous, is produced by the combustion of gaseous matter; and a moment's consideration will render this clear to our minds. Take a piece of Wallsend or Silkstone coal, and note how it burns on the hearth—first swelling and giving out tarry vapors, which ignite and form jets of flame; and these, encircling the coal, carry on the action, and give us the bright mass of flame which renders our English hearth so cheery a companion. On the other hand, take the coke which is derived from this same coal by its destructive distillation in the gas retort, and watch the clear coke fire as it burns. Here you have no flame of the kind given by the coal, but simply the glowing mass of fuel, with, at most, a small blue lambent flame playing over its surface.

What is it that has happened during the conversion of the coal into coke which made so great a difference in its method of combustion? If we analyze the coal and then the coke formed from it, we can at once trace the cause which has given us in the one case flame and in the other none:

	Silkstone Coal.		Coke from Silkstone Coal.
Carbon	79.0	..	89.0
Hydrogen	5.2	..	1.0
Nitrogen	1.5	..	1.0
Sulphur	1.5	..	1.2
Moisture	4.0	..	1.2
Ash	2.8	..	5.2
Oxygen	6.0	..	1.4
	100.0	..	100.0

The conversion of the coal into coke has been accompanied by the elimination of hydrogen, which, partly free and partly in combination with carbon, has been driven off, and has formed the coal gas; and with the destruction of the constituents capable of forming gas, the property of burning with flame has disappeared. Again, take a piece of pine wood, and ignite it. Its combustion will be marked by a large and luminous flame; while after conversion into charcoal, by elimination of its gas-producing constituents, it burns with a flameless combustion. From such experiments as these, we are forced to the conviction that flame is gas or vapor undergoing combustion; and inasmuch as combustion is chemical combination, we can define flame as being gaseous matter undergoing active chemical combination.

In all the earlier experiments with flame and with the other phenomena of combustion, it was only those substances which ordinarily burnt in air that were studied and experimented with—those bodies which would burn in air being called combustibles; while oxygen and air were looked upon as supporters of combustion. This conventional limitation of the processes of combustion still exists. A little reflection, however, shows us that such terms must be purely relative; as, if flame depends merely upon active chemical combination taking place between gases, it can only exist where both the combining gases are present, and it cannot matter which of them has the credit of being the combustible, as a jet of air or oxygen will burn just as well in an atmosphere of coal gas or hydrogen as the hydrogen or gas would in air.

It might be imagined that, having come to these conclusions with regard to flame, it would be a comparatively simple matter to solve the other problems connected with it; but, on studying the subject, it is at once found that the physical and chemical actions taking place are of the greatest complexity, and are in many cases governed by laws of which we know but little. In the propagation of flame, for instance, the combination of the inflammable constituents at the first moment of combustion gives rise to a great increase in temperature, which in many cases is sufficient to check and alter the combination, and in some instances even to cause dissociation of the products formed in the earlier phases of combustion; so that the combination seems to take place in waves, and not evenly, as one might at first imagine, with the result that the maximum temperature of a flame is never so great as one would expect from calculations based on the heat of combustion of the gases and the specific heat of the products and residual nitrogen from the air. These points, together with the rate of propagation and burning of gases, have been the subject of historical researches by Bunsen, Deville, Berthelot, and others; but much remains to be done before we arrive at any final conclusion on the subject.

By far the most interesting, and at the same time important, chapter in the history of flame, however, is the consideration of the causes which lead to the luminosity of those flames upon which we depend for most of our domestic lighting; and these offer so beautiful a field for both physical and chemical research, that they have attracted the attention of many observers, and form no inconsiderable addition to the chemical history of this century. In the year 1816, while engaged upon those celebrated researches which culminated in the discovery of the miner's safety-lamp, Sir Humphry Davy noticed certain facts which led him to work out and propound his theory of the causes which lead to

luminosity in flame—a theory which is generally stated as being that the presence of solid particles in the flame is essential to its luminosity. This theory remained unquestioned until 1868, when Prof. E. Frankland, in his celebrated communication to the Royal Society, showed that, although incandescent solid matter in a flame renders it luminous, luminosity is also in many cases produced when the flame contains very dense vapors at a sufficiently high temperature, and also that a non-luminous flame may be rendered luminous by increasing the pressure.

This gave rise to a storm of criticism; and the next few years drew forth a rich crop of papers on the subject. Prof. Frankland not only showed that flames might be luminous without containing solid particles, but advanced the theory that the luminosity in the flame of a burning gaseous hydrocarbon was due to the dense hydrocarbon vapors, and pointed out that the soot deposited on any cool substance held in such a flame contained hydrogen. To this W. Stein replied, showing that the deposited soot contained less than 1 per cent. of hydrogen, which was therefore probably only occluded by the carbon; and also that, if it had been present as a vapor in the flame, it ought, on being heated to the same temperature as the flame, to be once again volatile, which it undoubtedly is not. In the year 1874, Soret attempted to show that the cause of luminosity in flame really does depend upon the presence of solid particles, by focussing the sun's rays upon a luminous flame, and examining the reflected light by means of a Nicol prism; and rather later Burch pursued the same line of research, but employed the spectroscope for his examination of the reflected light. Their results point unmistakably to the presence of solid particles; and at the present time I think there is very little doubt in anyone's mind that, as far as the flames of candles, oil and gas are concerned, Sir Humphry Davy's theory is the correct one. Indeed, I am strongly of opinion that, although in certain points Davy went a little too far in his theory, had he been still among us we should have found that, in his own mind, he applied his theory more especially to the flames of our ordinary illuminants, as in his original memoir he speaks of "common flames," and distinctly says that "when in flames pure gaseous matter is burnt, the light is extremely feeble," and again, "the intensity of the light of flames depends *principally* upon the production and ignition of solid matter."

While this war of solid particles versus dense vapors was raging, Hilgard, Landolt, Blochmann, and Heumann were trying to trace the chemical actions taking place in various flames, and the causes which led to loss of luminosity when air was mixed with coal gas before combustion in the Bunsen burner. Heumann added the further proof to the "solid particle" theory of luminosity, that all flames which owe their luminosity to incandescent solid matter give definite shadows, while those in which luminosity is due to dense vapors, give none; and that candle, oil and gas flames all cause well-defined shadows.

This brings the work done upon the cause of luminosity down to the present time. The accepted description of a luminous flame now is that it consists of several zones—an inner one, in which no combustion is taking place; a central one, in which, either by selective combustion or by direct decomposition by heat, carbon or very dense hydrocarbons are liberated, and, being heated to incandescence at the moment of production by the combustion of other gases present in the flame, give it luminosity; and an outer one, which consists of the products of combustion and atmospheric air heated to incandescence, and in which combustion is complete.

The work of Soret, Burch and Heumann proves beyond a doubt that our ordinary illuminating flames contain in the luminous zones particles of solid matter; and the only solid which could oe present is carbon, either pure or containing the merest trace of hydrogen. The chief question now remaining to be solved, consequently, is the action taking place which leads to the formation of the solid particles in the luminous zone of the flame. During the last two years, I have devoted a very considerable amount of time and attention to the study of this subject; and I think I have found the key to this important problem—important from a practical point of view, because, until it is thoroughly solved, all efforts to improve our illuminating gases, and the burners in which we consume them, can only be the outcome of experiments made without definite idea of the means to employ in order to obtain the results we desire.

Coal gas is a mixture of hydrocarbons with hydrogen and small quantities of carbon monoxide; and it also contains traces of carbon dioxide, nitrogen and oxygen. The gas manager, however, does his utmost to eliminate the last three, which, if present in anything but the merest traces, would seriously injure the illuminating value of the gas.

An analysis of the South Metropolitan Company's gas gives the following as its composition:

Hydrogen	57.08
Hydrocarbons—	
Unsaturated (containing 0.035 p. c. of acetylene)	4.38
Saturated	33.99
Carbon monoxide	2.63
Carbon dioxide	0.79
Nitrogen	0.96
Oxygen	0.15
Bisulphide of carbon	0.02
	100.00

The unsaturated hydrocarbons consist of ethylene, benzene, propylene, butylene and acetylene, and probably also traces of crotonylene and others; while the saturated hydrocarbons consist chiefly of methane, with traces, of ethane, propane and butane.

[To be continued.]

The Valuation of Fuel Gas.

Dr. E. G. Love, in the *School of Mines Quarterly*, notes that the promoters of the various schemes for the manufacture and distribution of fuel gas have directed their attention more to the production of a gas which can be sold at a very moderate price, while in many cases at least they have overlooked the fact that the product they propose to sell must be judged primarily by its efficiency as a heating agent. A fuel gas at 25 cents per 1,000 feet is no cheaper than another having four times its calorific power at $1 per 1,000; and yet very many consumers will take the first as a much better bargain.

It is of the first importance that any fuel gas intended for general distribution should have a decided odor, in order that its admixture with the air may be readily detected. Experience has shown the wisdom of this requirement. Beyond this its valuation should be arrived at on the same basis as in the case of an illuminating gas, that is, the number of heat units which can be obtained for a given cost. Efforts have been made to introduce as fuels various gaseous products, having little if any illuminating power, and distributed by a special system of mains; but up to the present time results in this direction have not been encouraging. The gas has generally been odorless; and although supplied at a reasonable price its heating power has been low when compared with that of the illuminating gases.

In considering the extent to which the present supply of illuminating gas can be made to answer the purpose of a fuel gas, Mr. Love holds that the only question is one of cost, as it possesses a characteristic odor and its distribution is already effected. The following are results obtained by him in practical calorimetic tests of the carbureted water gas made by the Municipal Branch of the Consolidated Company of New York. The tests were made from time to time during the past two years; and the figures give the heat units per cubic foot at 60° F. and 30 inches pressure:—715, 692, 725, 732, 691, 738, 735, 703, 734, 730, 731, 727. Average, 721 heat units. Similar tests of mixtures of coal and water gases made by other branches of the same company give 694, 715, 684, 692, 727, 665, 695 and 686 heat units per foot, or an average of 694.7. The average of all these tests was 710.5 heat units, and this, for our present purpose, we may fairly take as representing the calorific power of the illuminating gas of New York. One thousand feet of this gas, costing $1.25, would therefore yield 710,500 heat units, which would be equivalent to 568,400 heat units for $1.

The common coal gas of London, with an illuminating power of 16 to 17 candles, has a calorific power of about 668 units per foot, and costs from 60 to 70 cents per 1,000.

The various processes for producing a simple fuel gas claim little or nothing in the way of illuminating power. The gas is made at small cost, and is usually sold for about 50 cents per 1,000 feet. Its value as a heating agent depends mainly upon the hydrogen and carbonic oxide which it contains, with sometimes a small percentage of marsh gas and other hydrocarbons.

If gas was sold by weight these fuel gases could make a better showing in calorific power, but as it is sold by volume and undoubtedly always will be, little can be expected of a gas which has its principle heat-producing constituent—the carbon—in an already half-consumed condition.

The calorific power of hydrogen is 325.5 units per foot, when the latent heat of the aqueous vapor produced is utilized. When the vapor is not condensed it has only 274.1 units. Carbonic oxide gives 324.7 heat units per foot, its combustion producing no aqueous vapor.

The product obtained by decomposing steam by incandescent carbon as effected in the Motay process, consists of about 40 per cent. of carbonic oxide and a little over 50 per cent. of hydrogen.

This mixture would have a heating power of about 300 units per foot, and if sold at 50 cents per 1,000 feet would furnish 600,000 units for $1, as compared with 568,400 units from illuminating gas at $1.25 per 1,000. This illuminating gas if sold at $1.15 per 1,000 would therefore be a more economical heating agent than the fuel gas mentioned at 50 cents per 1,000, and be much more advantageous than the latter in that one main, service and meter could be used to furnish gas for both lighting and heating.

A large number of fuel gases tested gave from 184 to 470 heat units per foot, with an average of 309 units. The price charged for the gas, however, was in some cases unknown, although presumably as low as 50 cents per 1,000.

Some companies have adopted the plan of selling gas to be used for fuel purposes at a somewhat lower rate than that for lighting, and in this way are encouraging its use. Of 362 gas companies in the United States, 165, or over 45 per cent., give some reduction to consumers using illuminating gas for fuel purposes. This discount varies from 5 per cent. to over 60 per cent. on the price charged for the gas used for lighting. Eighty-one companies have a reduction of 25 per cent. or more, while the average discount is a little over 24 per cent. From these facts it is argued that the advantages of utilizing our present supply of illuminating gas for fuel purposes are very great, and perhaps sufficient to warrant the prediction, that with a cheapening of the cost of production, etc., encouraged by State and municipal control, the illuminating gas will be made to answer the double purpose of lighting and heating.

The Loss of Head Due to a 24-Inch Valve.

Engineering Record notes that at a meeting of the American Society of Civil Engineers, held March 2, a paper entitled "On the Loss of Head Resulting from the Passage of Water Through a 24-Inch Stop Valve," was presented by Emil Kuichling. Since some of the results recorded by him differ from those of Weisbach, now generally considered authoritative, a brief abstract of Mr. Kuichling's paper is given below.

The loss in head along a section of pipe was measured by an instrument, which indicated by the difference in height of two communicating columns of mercury the difference in the hydraulic pressure existing at any two points in a line of water pipe. In principle, the instrument consists of two vertical glass tubes, connected at the bottom and filled with mercury, while the upper ends of these tubes are connected with the water mains by suitable pipes and cocks. On the admission of water into the two tubes, the mercury will be depressed in one and raised in the other, until equilibrium is established, whereupon the difference in the heights of the two mercury columns is read off on a suitable scale, whose divisions correspond to known pressures of water, as determined by careful experiment beforehand.

This instrument was used by the writer and John Thompson, M. Am. Soc. C. E., for measuring the losses of head in the passage of the water through a partly opened 24-inch stop-valve. This valve was made by the Ludlow Valve Manufacturing Company, of Troy, N. Y., and has two parallel and circular cast-iron disks, whose faces are about 6 inches apart and 26.5 inches in diameter. The brass rings forming the two valve seats are stated by the manufacturers to be 24.06¼ inches in internal diameter. As the disks are raised, a lune shaped orifice is presented for the discharge of the water. The area of this orifice was computed for each motion of the stem of one-third of an inch. The valve was set on one arm of a Y-branch in the pipe conduit, and the taps for the hose attachments with the pressure-difference gauge was inserted with a tapping machine, so as to stand truly at right angles to the surface of the 24-inch cast iron pipes and without projecting into its interior.

The water supply was derived by gravity from the storage reservoir through a continuous line of cast iron 24-inch pipe, 46,219 feet in length, to the valve in question, and was discharged from this valve into the distributing reservoir, through about 648 feet of similar pipe. With the valve wide open, the pipe would, accordingly, have a total length of 46,867 feet, a total head of 112.89 feet, and a nominal diameter of 2 feet. Several hours were spent in making the observations recorded above, and much care was taken to obtain accurate results. The maximum heights in the two tubes were taken simultaneously by an observer at each tube. In every instance, several minutes were allowed to elapse after changing the amount of valve opening, before making an observation, in order to allow a uniform flow to be established.

The results of the experiments are shown in the table.

Height of opening ÷ diam. full orifice	1/12	7/96	2/24	1/24	1/8	3/8	5/12	11/24	1/2	7/12	8/8	1
Loss of head, feet of water	9.281	8.100	7.203	5.304	2.844	2.078	1.532	1.112	0.797	0.378	0.189	0.00
Kuichling's co-efficient	41.21	35.56	31.35	22.68	11.89	8.63	6.33	4.58	3.27	1.55	0.77	0.00
Weisbach's co-efficient	45.50	37.50	31.00	17.00	7.40	5.52	4.03	2.90	2.06	1.00	0.60	0.00

Weisbach's experiments were conducted with small pipes and valves, and, consequently, it is natural to expect some variation between his co-efficient for the value of n in the formula for the flow of water through a gate, viz., $y = n\frac{v^2}{2g}$, and those the co-efficient for a 24-inch valve. Nevertheless, the difference between the figures is very great.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

AFTER much talking, Mr. John Q. Brown, Gas Inspector for San Francisco, has determined to enforce the defective gas fixture ordinance passed by the Board of Supervisors something more than a year ago, but which has been more honored in the breach than the observance. According to a correspondent, the Inspector recently swore out warrants for the arrest of the proprietors or managers of eight of the principal hotels of the city, charging them with misdemeanor in having violated a city ordinance through failing to file written reports regarding the condition of gas pipes and fixtures in their establishments. The extraordinary number of fatal cases of asphyxiation by illuminating gas reported in the city within the past six months is the reason for the Inspector's action. The defendants assert that as the gas fixtures in their buildings are kept in proper condition the filing of the required reports is unnecessary, hence they will contest the validity of the ordinance.

MR. D. E. THOMPSON, President of the Lincoln (Neb.) Gas Company, has placed contracts for the extension of the works which involve the expenditure of something like $125,000. This is rather strong evidence that the proprietors are satisfied with the stability of their investment.

AT the annual meeting of the Charleston (S. C.) Gas Light Company all was harmony, which is not to be wondered at, from the fact that President Turner's annual report showed that the Company was in a most flourishing condition. The following officers were elected: Directors, A. S. Johnson, W. B. Smith, John S. Riggs, M. Israel, Geo. W. Williams, H. E. Young, John C. Simmonds and Geo. L. Buist; President, Thomas Turner.

THE Directors of the Wilmington (Del.) Coal Gas Company have perfected the following organization: President, Edward Betts; Vice-President, Geo. S. Capelle; Secretary and Treasurer, William G. Taylor; Superintendent, Thos. Curley.

THE clever Superintendent of the Elgin (Ills.) American Gas Company, Mr. Robert F. Fitz, has met his fate in the form of Marie Wilcox, the charming daughter of Col. and Mrs. J. S. Wilcox, of Elgin. The knot was tied on the evening of March 16th, and now there is a handsome suite of bachelor apartments to let at Elgin.

WE have two "items" from Richmond, Va., that strikingly illustrate the temporal fitness of things. The first one is to the effect that on the afternoon of March 6th Councilman Adam Diacont and others conducted a prayer meeting at the City Gas Works.

THE second "item" states that on the following morning Mr. Andrew Merkle, who for many years had been an efficient attache of the City Gas Works, died.

PETER PAULEY recently sued the proprietors of the Johnstown and Gloversville (N. Y.) Gas Light Company, for damages to recover the value of a shade tree, that grew in front of the plaintiff's premises on Fulton street, Gloversville, which he claimed was killed through the acts of the defendant's agents. A verdict by direction of Court was retured for defendant, on the ground that as the plaintiff's deed only ran to the side of the street, and that as the tree was in the highway, his property in the tree was not of a nature sufficient to give him a right to maintain the action.

A SLIGHT explosion was reported, on the 9th inst., from the works of the Middleboro (Mass.) Gas Company. Abial Gibbs was severely burned about the face and hands.

MR. VAN STEENBERGH is said to be interested in the latest "strike" at Newark, N. J.

THE "looking backward" and "guessing forward" maunderers who lose no opportunity of exploiting their fad of paternal government have often quoted the case of the Hamilton (O.) Municipal Gas Works as an example of the benefit accruing to the residents from such ownership. The works are new, are said to have been well built, and to be fully up to the requirements of the city; but with gas at $1 per 1,000—which is said by General Meyer, of Cleveland, to be an extravagantly high price—the city authorities at Hamilton are really not earning interest on the real cost of the plant. Having been so badly taken in by the specious promises of those who foisted the plant on the city, it is natural that the taxpayers should view with suspicion and distrust the motives of the agitators who have long and loudly clamored for the installation of a municipal electric lighting plant at Hamilton. Pursuing the subject further, we give the following, recently forwarded to us by a correspondent at Cincinnati. "For several years there has been more or less speculation as to the feasibility of erecting an electric light plant in Hamilton. The subject to day is being vigorously discussed by the local press, and the people are beginning to manifest no little interest in the project. It is true the city is literally lost in darkness when night comes, as the gas illumination (maintained from the city works) is of so little consequence that a number of candles would answer for illuminating purposes equally as well, and would be more economical to the taxpayers. It is said by those in a position to know that an electric light plant will cost from $60,000 to $75,000. The people think the price exorbitant, and, consequently, they object. The principal and most vital question is, 'Who shall erect the plant, if erected at all?' It is well known that certain parties who heretofore have always been successful in being awarded various contracts by the city are again to the front, and from indications are doing some prodigious work in order that they may persuade the council to believe that they represent the only system extant in the country. This kind of manipulation has been going on for the past 10 years, and has been carried on with such a wanton and extravagant hand that the people are beginning to wonder if they have any rights. Why is it that all of a sudden well-known lobbyists are flying to and from Columbus? Hamilton has one or two distinguished personages of that character in its midst. It is said by the Gas Trustees that an electric light plant at this time is out of the question, as it would cost $20,000 a year to operate it, and as *the gas works are far from self-sustaining*, it would be inadvisable to erect an electric light plant, which, at the very beginning, would be an expensive luxury to the city. Hamilton is probably the only city in the State of equal size that is not illuminated by electric light. In this respect she is behind, but whether the people are willing to pay for an electric light plant remains for them to determine."

IN the meantime, it is well to remember that the municipal gas works of Hamilton were originally started because the old Hamilton Gas Light and Coke Company insisted on holding the authorities to the terms of a contract that, when it was made, was largely in favor of the city, but which, after the lapse of a portion of the time limit thereof, subsequently was very profitable to the company. Rather than submit to a decidedly unjust revision of the terms of the agreement the company determined to hold out for its rights, with the result that the credit and prestige of the city were used, in a manner strongly savoring of revenge, to blot out a franchise that the Hamilton Gas Light and Coke Company had paid for many times over in the shape of concessions to the authorities in the placing of and the supply of gas to the public lamps. The Bellamy's, Rosewater's, Bemis's and other Children of the Abbey, when, in the ease of the "hallowed" precincts of their libraries, class rooms or presidential chairs, may dilate with great freedom over the virtues inherent in the principles of paternal government, but it goes without saying they would pipe a different tune were the government to insist that every educational institution in the country should be under its direct charge. In fact, if we are to have paternal government, the proper place to begin the same should be where youth receives its training.

ANOTHER beautiful muddle in Ohio is presented in the 60-cent. gas ordinance at Cleveland, O., testimony over the merits of which is now being taken before Master-in-Chancery Belford. Several prominent experts have been examined, and the net result of their testimory so far appears to be an awakening to the fact, by General Meyer and his supporters, that their jaws cannot conveniently hold in repose, much less to permit them to readily masticate, that which they so ravenously bit off. The Company stands its ground, and in consequence the residents are actually inconvenienced. A fortnight or so ago, as was stated in our last, a deputation of marketmen prayed that kerosene be replaced by gas in the market buildings; nor was it a question of price with them, as they reinforced their pleading by asserting their willingness to pay the difference—40 cents per 1,000 cubic feet—between the city's estimate of the worth of gas as an illuminator and the value put upon it by the Gas Companies. And even the clerks in the various public buildings are objecting. The people at large, too, are very restive. The agitation has so progressed that the officials at last are "thinking out loud" that they might have been "mistaken," as will be seen by the following from a recent issue of the Cleveland *Leader*: "Hints that there would be some highly interesting developments concerning the lighting question were dropped by several Councilmen before their meeting of a week ago. Details were not to be obtained, but there was a plain intimation that a sensation was in prospect. Later it developed that the great State secret was nothing less than a movement which may lead to a compromise with the Gas Companies. It was stated that a number of the Councilmen had compared notes and agreed upon what they considered to be a fair basis for the settlement of the controversy. They are credited with having decided upon a line of action which, if met in a spirit of concession by the Gas Companies, may lead to a compromise. A committee to wait upon the East Side Company was named last night, and it is said that their sentiments had been learned in advance—that they had not been chosen at random, but with a view to securing definite ends. While nothing certain could be ascertained from them, it is thought that the Councilmen interested in the matter will be willing to have the city accept a percentage of the receipts of the Companies, or to have a rate fixed for gas in the neighborhood of 75 cents per 1,000 cubic feet. The friends of the 60-cent ordinance declare, however, that no such compromise can pass the Council. The subject was first called up by the reading of petitions from persons living on newly laid out streets in the suburbs of the city. They related that the Gas Companies, owing to their trouble with the city, were refusing to lay new mains. The result, that the streets are left in darkness, and that no gas can be obtained for the illumination of the houses, was complained of. The petitioners said that in addition to being inconvenient, the inability to get gas was damaging their property. They found it impossible to sell lots, and the result was serious loss to them. The petitioners also stated their belief that the present litigation is likely to be kept in the courts for years, and that they are entitled to immediate relief. The papers were received and filed. Then Ald. Bates introduced a resolution, the aim of which is to bring about a compromise. While it would naturally be regarded as a sequence of the petitions, it is doubtful, in the light of other events, that such was the case. Another Alderman said that a resolution similar to the one introduced by Mr. Bates would have been presented even if the petitions had not been forthcoming. The Bates resolution was as follows:

"'*Resolved*, That the President of the Council be requested to appoint a committee of three members to confer with the Cleveland Gas Light and Coke Company with a view to a settlement of the pending differences between said Company and the city, in accordance with the petitions presented here to-night.'

"The resolution was adopted without discussion, and there was no roll call, which might have shown the strength of the contingent willing to compromise. Messrs. Avery, Bole and O'Brien were appointed as the committee."

THOSE most rabid in the support of the 60 cent gas ordinance need have no fear of a settlement based on the 75 cent compromise. This figure is 15 cents too low, for Cleveland can hardly expect to be served with gas at a rate lower than that which prevails in London, all things entering into the situation being considered.

DEPUTY ATTORNEY-GENERAL HOGAN has begun, in the name of the State, an action for the dissolution of the corporation known as the Cooperstown (N. Y.) Illuminating Company.

THE McKeesport (Pa.) Water and Lighting Commissioners have submitted a report recommending that an electric lighting plant be installed, to be operated by the city. The estimated cost is put at $60,000, the plant to be equal to the maintenance of 300 arc (2,000-candle power) and 800 incandescent lamps—the latter to be employed for the illumination of the public buildings. It is not intended to take up commercial lighting.

SUPERINTENDENT JOHN GILCREAST, of the Woburn (Mass.) Gas Light Company, is busy putting in new services, and the output of the company this year will be greater than that reported for any other twelvemonth since its incorporation.

SUPERINTENDENT COOPER, of the Exeter (N. H.) Gas Light Company, unless all signs fail, is about to announce a reduction in gas rates. Careful management works wonders.

THE Brownings are going to shake up the gas supply conditions over in Staten Island (N. Y.) before long. Is it not time that the real remedy was applied to this situation?

MR. WILLIAM A. WHEELER, of Cattaraugus, has introduced a bill in the New York legislature which seeks to prevent gas companies from removing gas meters from houses against the protest of the tenants, unless an order for such removal has been obtained from a court.

ANTHONY CLINCHY has been appointed inspector of gas meters, with headquarters in this city, vice Ferd. Erhart, whose term of office was at an end.

THE new holder for the East St. Louis (Ills.) Gas Company will have a capacity of 60,000 cubic feet. Work on the tank is under way.

THE following is the copy of an advertisement setting forth the advantages of gas for cooking and heating that occupies a prominent position in the columns of the leading newspapers of Wilmington, Del.: "Gas stoves are invaluable and should be investigated by careful housekeepers. About 1,200 are in use in this city and the number would be greatly increased if their merits were fully understood. As 'cookers' they are unrivalled, and are far superior to coal or wood stoves in cooking meats or vegetables. As water heaters and ironers they are most useful, especially when the weather is too warm to use the ordinary stove or range. As heating apparatus that can be moved from room in a few minutes by the housekeeper; they are most convenient. As assistant heaters in rooms where furnace or steam heat will not ascend on the windward side they have given great satisfaction. As permanent heaters in rooms that cannot be reached by heating flues they have given much comfort. As intermittent heaters, where heat is wanted only an hour or two at a time, they are economical. For offices and stores, when the weather is rather warm for furnace fires, they may prevent sickness. For spring and autumn use, when mild days make furnace fires oppressive, troublesome and expensive, they are comfortable and economical. As fires that can be started in a minute and extinguished in less time, they are most satisfactory. As heaters that avoid ashes, coal gas and dust, they are valued by prudent housekeepers. Modern gas stoves are not only useful, but ornamental. The gas, the stoves, the fixtures and the putting in are quite inexpensive. Samples and descriptions can be seen at the gas office."

IN our last issue we reported the resignation of Mr. Eugene H. Yorke from the post of Superintendent of the Brockton (Mass.) Gas Light Company, and in complement thereto we may note that on his way to the railroad depot, he stopped at the gas works to bid good-bye to his former subordinates; but before the adieus were completed a committee of the men (Messrs. James Moran, James Hunt, David Moran, H. J. Thunerby, Edw. Pendergast, Charles Bush, Austin Hunt, William Fitzgerald and E. B. Mooney) and a special committee (Miss Hattie L. Boden, "typewritist") presented Mr. Yorke with a handsomely engraved gold headed cane, which bore the inscription, "Presented to E. H. Yorke, Superintendent, by employees of the Brockton Gas Light Company, March 2, 1892." The presentation was made in the following words: "It is with regret that we have learned that you are to sever your connection with the Brockton Gas Light Company. During the four years you have acted as Superintendent our intercourse has been of mutual pleasure and satisfaction. Now that we must part, we desire to show you our esteem; and to lessen the poignancy of the parting ordeal we therefore present to you this gold headed cane, sincerely trusting that it will be to you a support through life, and that your future may be a path (straight as the cane) to health, enjoyment and success; and as the cane is mounted with a chased gold head, may your aims in life culminate in golden fortune, joy and happiness; and when that climax is reached in memory cast a retrospective glance at those who subscribe themselves the employees of the Brockton Gas Light Company."

THE Executive Committee of the Toronto (Can.) Board of Aldermen held a meeting a few days ago, and one of the matters considered by them was a recommendation from the City Engineer to the effect that the Consumers' Gas Company be required to pay annually into the city treasury the sum of $10,000, said sum to be held as the amount necessary for repaving the streets disturbed by the Gas Company. The Committee declined to sanction the proposition.

THROUGH an explosion of a steam pipe in the engine room of the electric lighting station of the St. Paul (Minn.) Gas Light Company, two employees were severely injured, and the lights were shut off for a time. The damage to property was not important.

THE consolidated Fort Dodge (Ia.) Gas, Electric and Power Company's electric plant will shortly be removed to a new building, to be erected on a plot adjoining the gas works.

JUDGE NEY, of Dubuque, Iowa, has handed down a decision in the case of J. K. Graves against the Key City Gas Company, of Dubuque, which was an application by plaintiff for a permanent injunction restraining the Company from cutting off a supply of gas to his residence. Mr. Graves originally sold the controlling interest in the Company to defendants, a part of the purchase being an agreement that plaintiff should be entitled to a supply of gas free for the period of 20 years, from July 1, 1880, in his residence on Fenelon Place, "for ordinary purposes, including gas log in library." Defendant kept up the supply without demur until July, 1890; but having found that the gas consumed in the Graves household for the year then ended had amounted to 330,000 cubic feet, defendant warned plaintiff that unless the volume used in the future was greatly diminished the supply would be cut off altogether. In the following January the meter records showed no decrease in the consumption, and the Company thereupon ordered the service stopped. Graves sued out a temporary injunction and the case has been going on ever since before the courts in one shape or another. Finally, the matter was remanded to the district court on a trial of the merits for a permanent injunction. Judge Ney's construction of the contract is as follows: He finds that Mr. Graves' use of gas has been excessive, and asserts that he is entitled to 64,000 cubic feet of gas for illuminating purposes in the residence; to 24,000 cubic feet for use in gas stoves; and to 12,000 cubic feet for use in gas logs—also for the quantity needed to keep two lamps alight in front of residence from dusk to daylight, each night in the year. The case will be appealed. Pending this decision the Company offered to give Mr. Graves the use of 15,000 cubic feet of gas per month, and the quantity necessary for the lamp posts in addition, which offer was rejected.

THE authorities of Greenbush, N. Y., advertise for sealed proposals for lighting the streets with 175 incandescent electric lamps, of 25 candle power each. The competition will close to-morrow.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Some Corrections in our Report of Mr. McKay's Paper.

[The following correspondence between Mr. William E. McKay and Mr. C. F. Prichard, Secretary of the New England Association of Gas Engineers, is self-explanatory.—EDS.]

HOTEL GLADSTONE, Dudley street,
DORCHESTER, MASS., March 15, 1892.

MR. C. F. PRICHARD, Sec. and Treas.—Dear Sir: Referring to the issue of the AMERICAN GAS LIGHT JOURNAL of March 14, 1892, I desire to call your attention to the following misprints in the published copy of the paper, "A Gas Works as a Heat Engine."

Page 363, 2d column, par. 7, should read, "Therefore, at the outlet of the hydraulic main, for every 1,000 cubic feet of final gas at 60° and 30", there leaves the hydraulic main 2,850 cubic feet of gas and vapor, exclusive of the vapors of tar."

Page 365, Note L, last equation, should read—

$$\left(.21065 \div \frac{15.96}{2}\right) \times 16.831 = .4437.$$

Page 367, Note R, should read

"The relation between the conditions of a gas under varying circumstances is expressed by the formula

$$V P (1 + \propto T) = V' P' (1 + \propto T).$$"

Will you kindly have attention called to these errors, that they may be corrected in a future issue of the JOURNAL. It is most creditable that in the publication of so many figures there should be so few errors.

Yours very truly, WILLIAM E. MCKAY.

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876-2 WM. N. GRUBB, Secretary.

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Product of the Staunton Gas Works, Staunton, Va.

Two hundred to three hundred (200 to 300) barrels, f.o.b. this city, in good iron-bound barrels to hold 50 gallons each. Address, until April 10th, 1892,

876-3 JOHN T. LONG, Superintendent.

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Tar will be delivered into barrels at the Company's works. Barrels to be supplied by the purchaser.

The Company does not bind itself to accept the highest or any tender.

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876-1 J. F. SCRIVER, Manager and Secretary.

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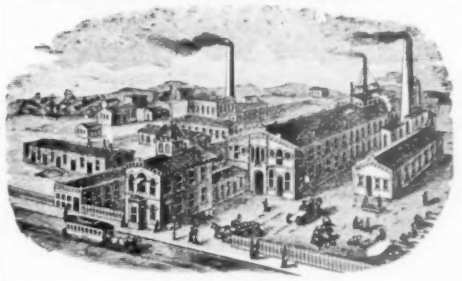

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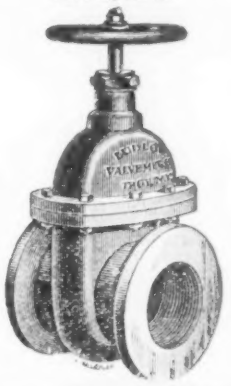

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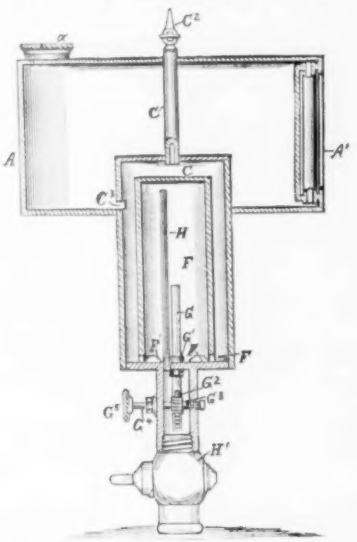

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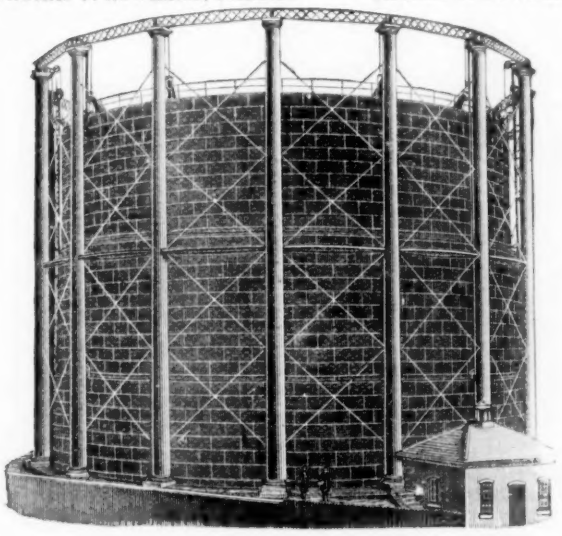

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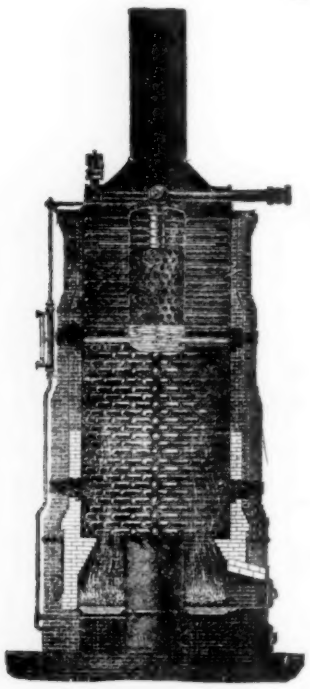

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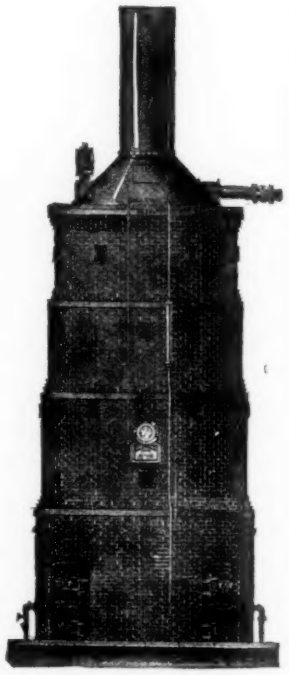

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ST. PAUL GAS LIGHT COMPANY	St. Paul, Minn.
NEWARK GAS LIGHT COMPANY	Newark, N. J.
CONSOLIDATED GAS COMPANY	Baltimore, Md.
NASSAU GAS LIGHT COMPANY	Brooklyn, N. Y.
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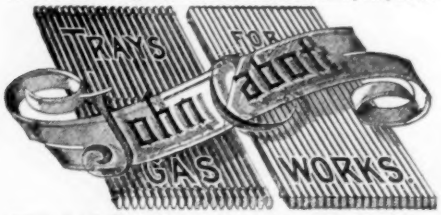

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Every Box Warranted.

SIZES FROM ONE TO SIX FEET.

Special Sizes to Order.

Price per Gross, 75 Cents.

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10 GAS HEATING STOVES,

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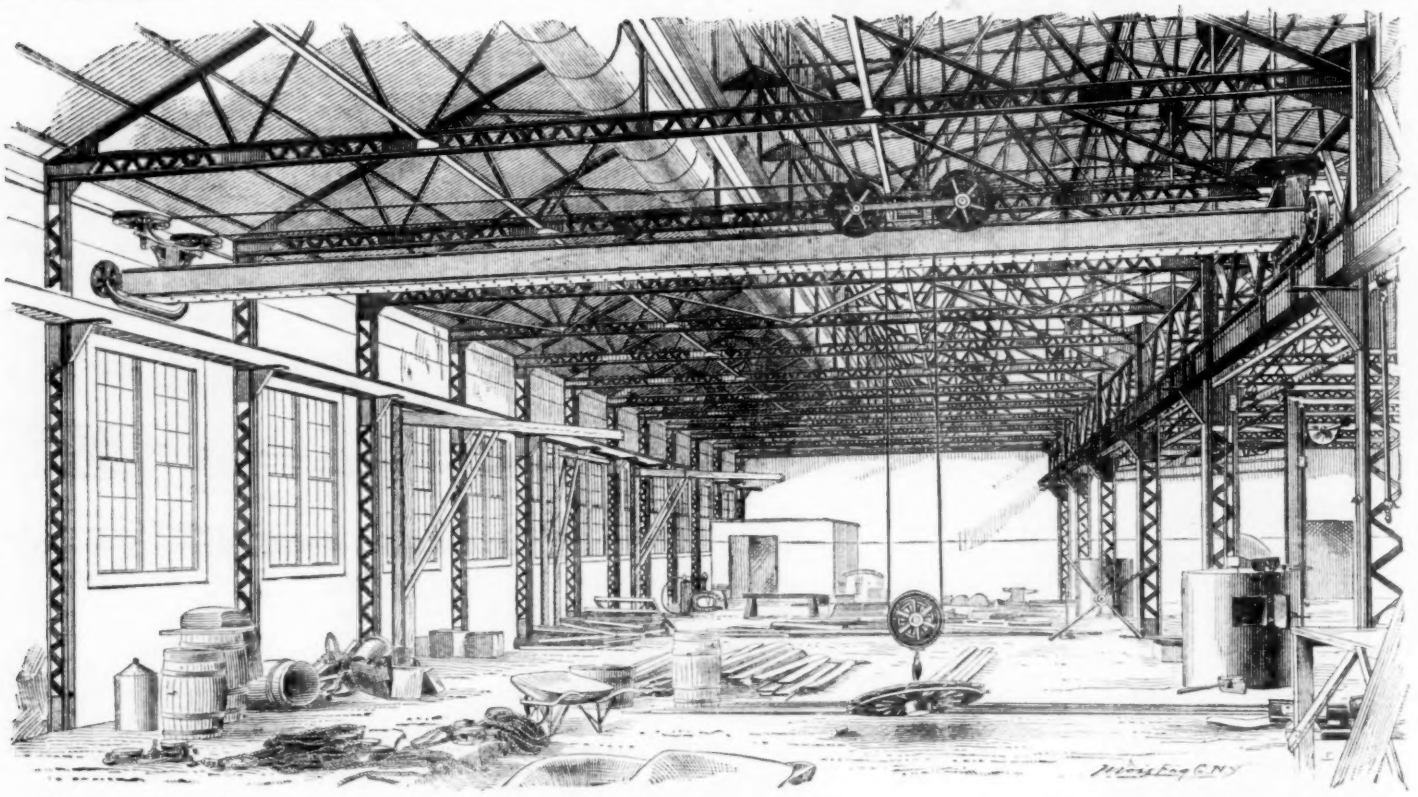

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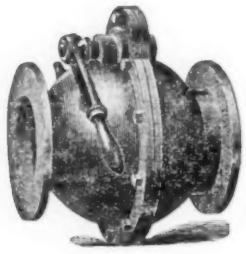

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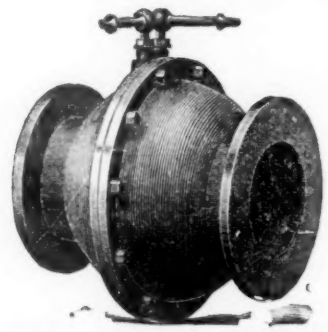

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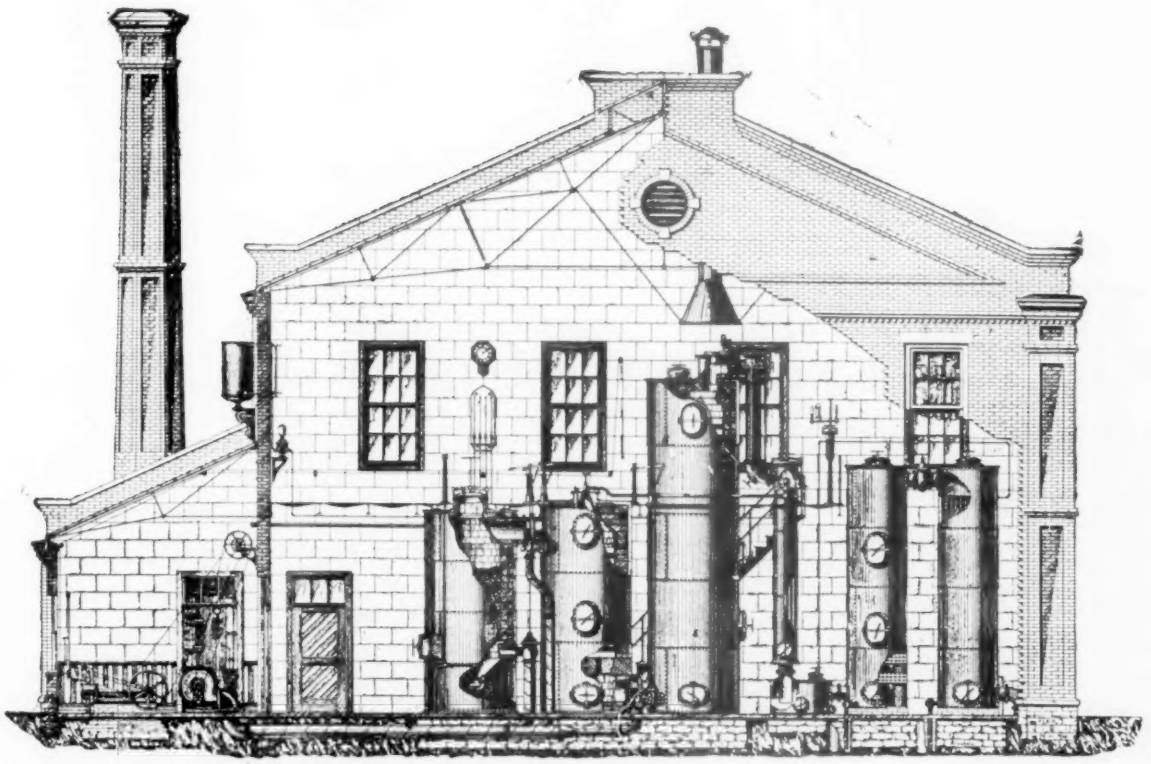

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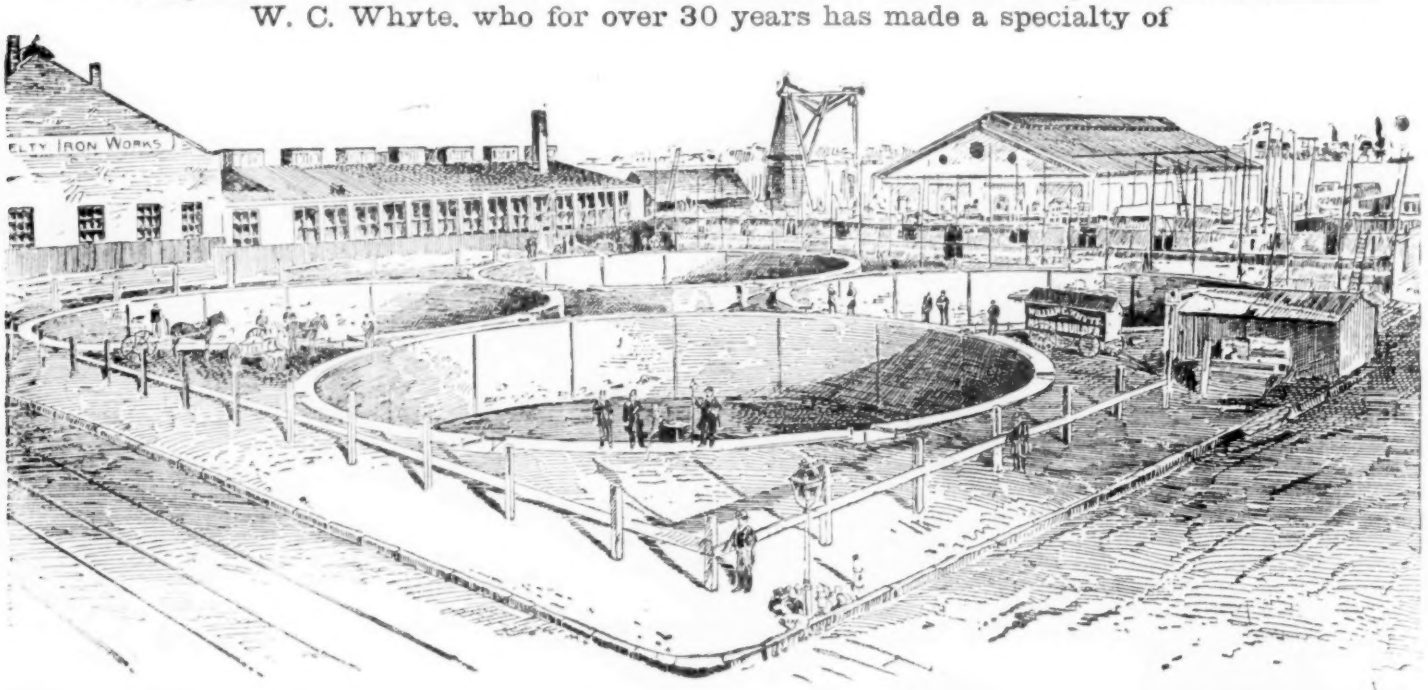

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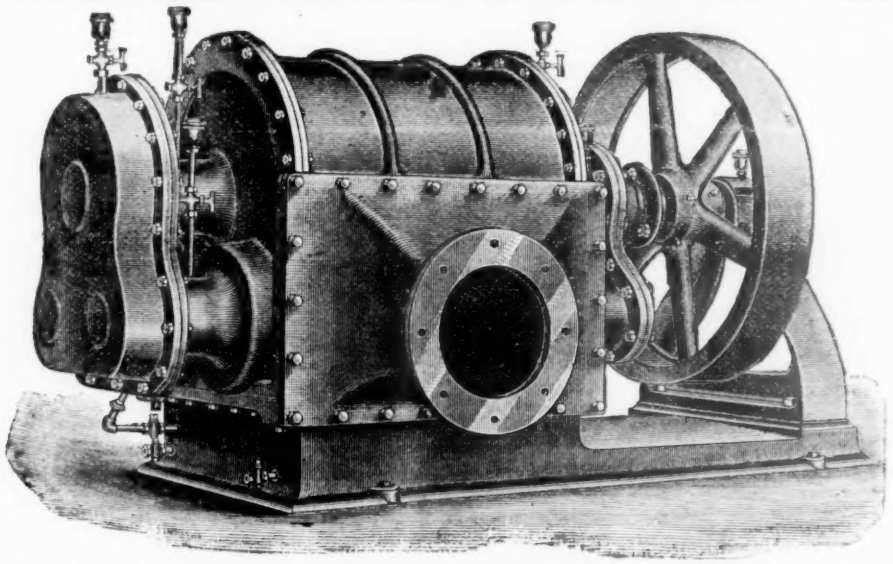

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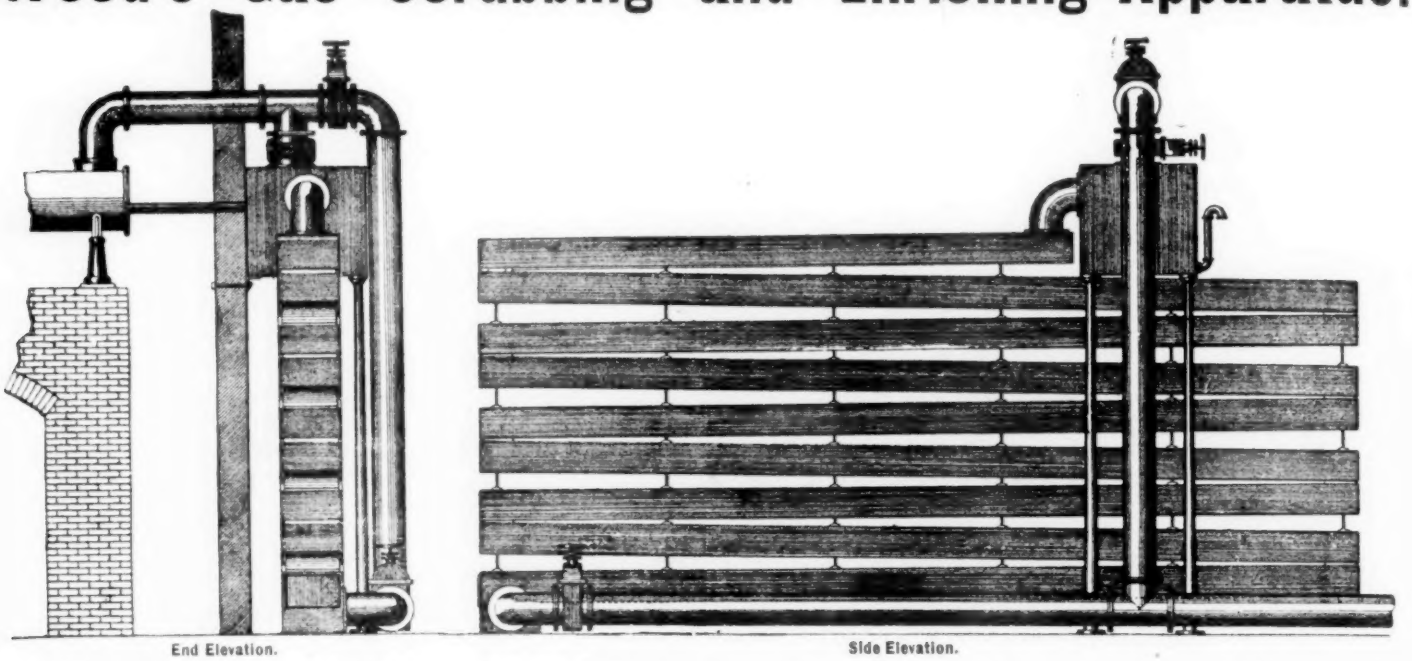

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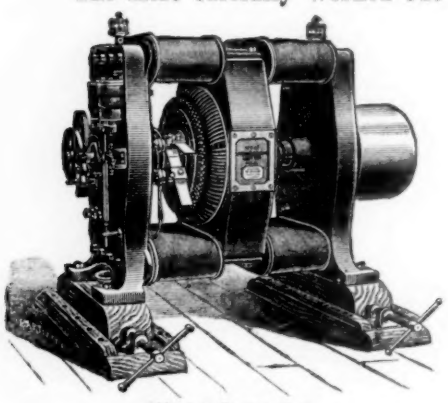

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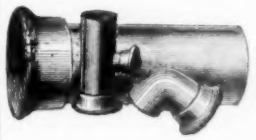

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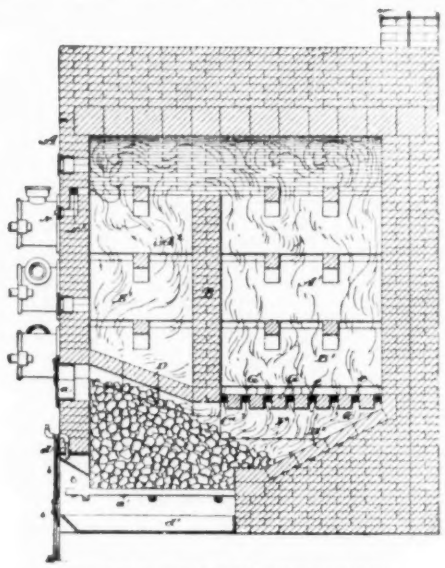

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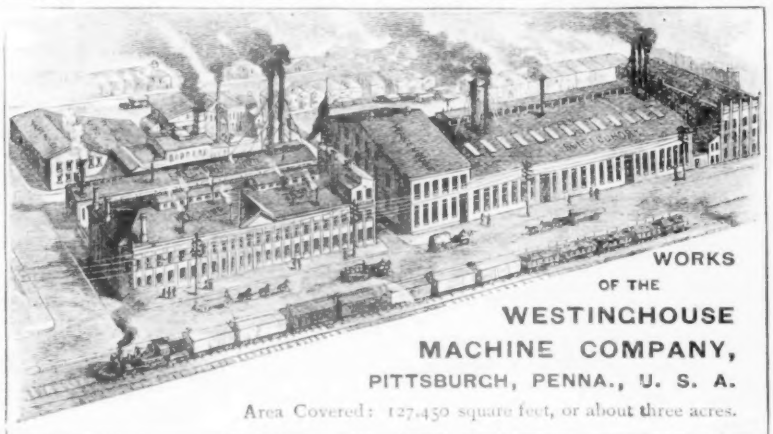

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WESTINGHOUSE STEAM ENGINES alone are produced, to wit:—Junior Automatics, in 7 sizes, from 5 to 75 H. P.; Westinghouse Standard Automatics, in 13 sizes, from 5 to 250 H. P.; Westinghouse Automatic Compounds, in 11 sizes, from 8 and 13 x 8 Cylinders to 23 and 40 x 20 Cylinders; all of which are manufactured in quantity to hardened steel templates, and carried in stock, ready for shipment.

REPAIRS ARE ALSO MANUFACTURED in quantity to templates, and carried in stock.

THE COMPANY MANUFACTURES, for its own use, all Iron and Brass or Bronze Castings, as well as all its own Iron and Steel Forgings, from the smallest to the largest; thus controlling, in a measure, the quality of the materials entering into the Engines which it produces.

THE PRODUCING CAPACITY OF THE COMPANY'S WORKS is equal to about four (average) Steam Engines per diem, or about 5000 H. P. per month, or about 60,000 H. P. per annum.

OVER 6,000 OF THESE ENGINES HAVE BEEN SOLD during the past ten years, with constantly increasing orders.

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PRINCIPAL OFFICE AND WORKS, Waltham, Mass. BOSTON OFFICE, Room 18, Vulcan Building, 8 Oliver Street.

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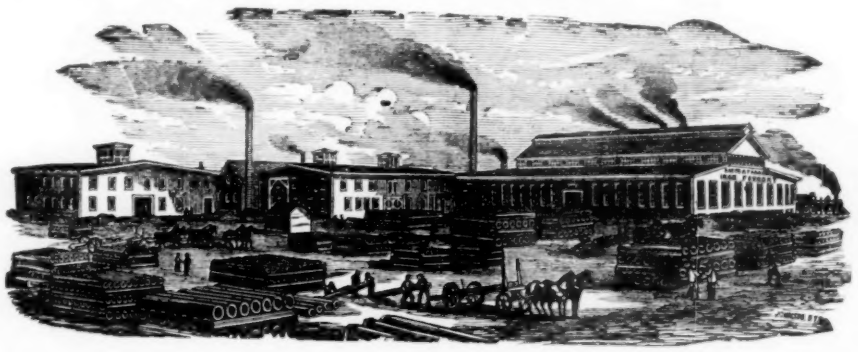
OF ANY CAPACITY.



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SELF-SEALING AND PRESSED STEEL MOUTHPIECE LIDS.

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AND OF THE LATEST IMPROVEMENTS,

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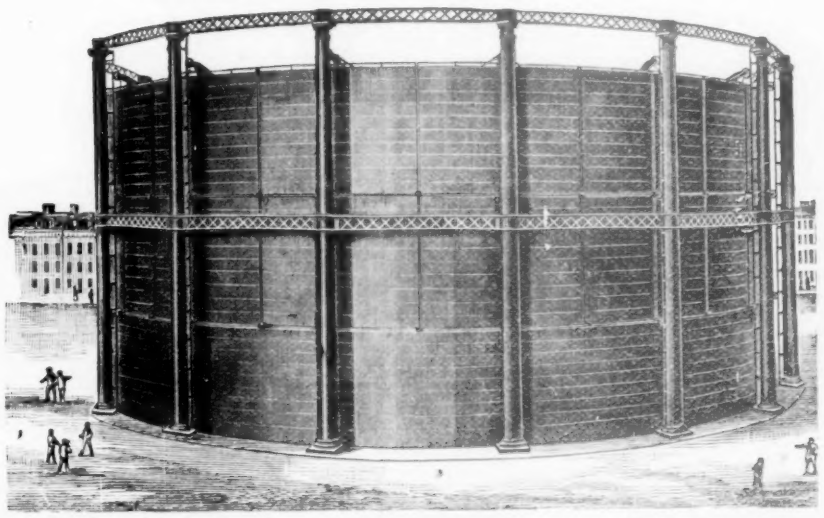

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BENCH CASTINGS

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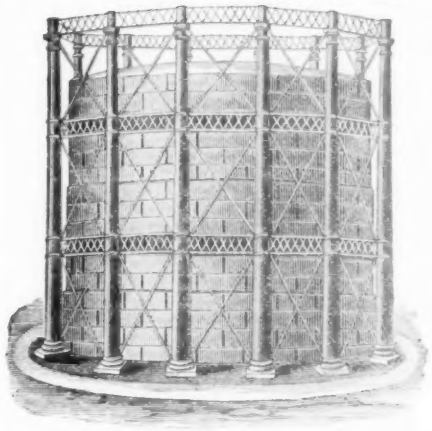

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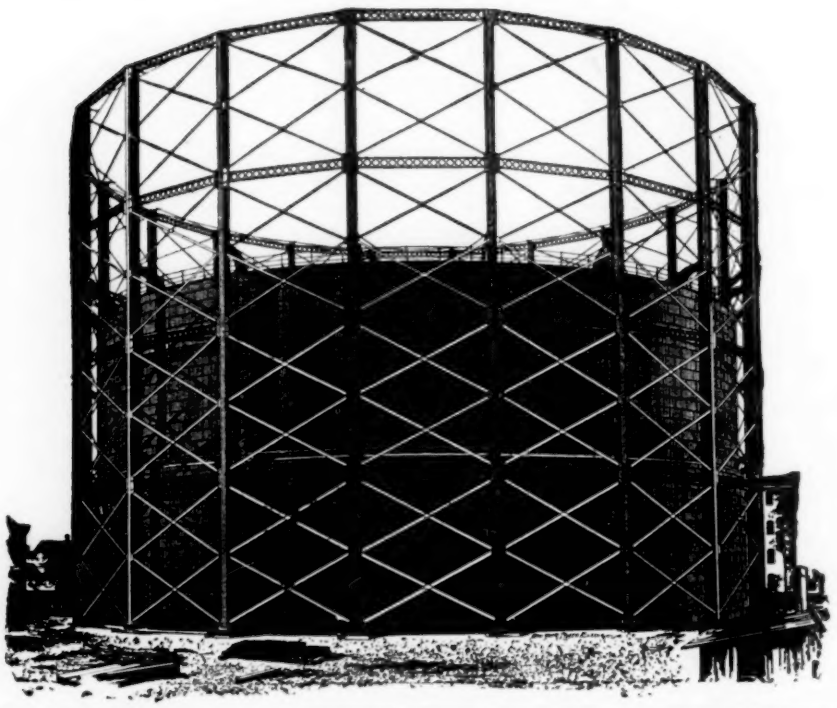

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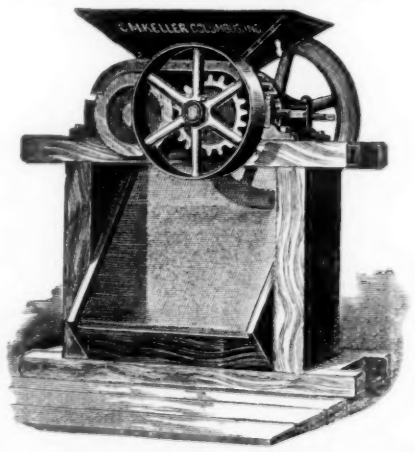

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